



## Installation Manual OF WINForce 10 kW

**WIPO Wind Power Co.,Ltd**

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# Introduction

This manual is for the use of an authorised WIPO dealer during the installation of a WINForce 10 kW turbine. The instructions in this manual are for reference only and all work must be completed by trained and qualified personnel and in accordance with national laws and regulations.

# 1 System Component Introduction

## 1.1 Turbine

### ① Generator

Rate power: 10KW

Rate RPM: 150

Rate voltage: 195V

Rate current: 25A

Rate frequency: 47.5Hz

Start Torque: 17N.m

### ② Yaw Motor

### ③ Position Sensor

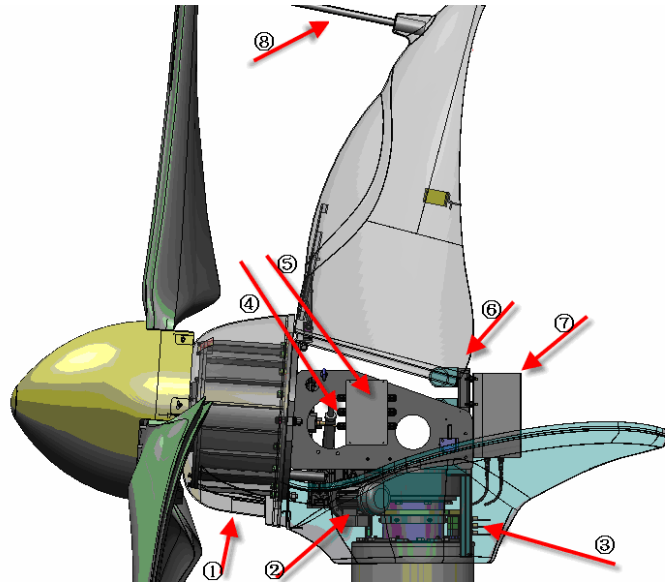
### ④ Electric actuator

### ⑤ Surge protector box

### ⑥ Emergency control dumpload

### ⑦ Nacelle control box (Box1)

### ⑧ Wind speed and direction sensor



## 1.2 Hub



Use to fix blades.

## 1.3 Blade

### Specification of Blade:

Length: 4800mm

Weight: 25Kg

Cut in wind speed: 3.5m/s

Survival wind speed: 59.2m/s

Rate RPM: 150

Blade area: 0.92m<sup>2</sup>



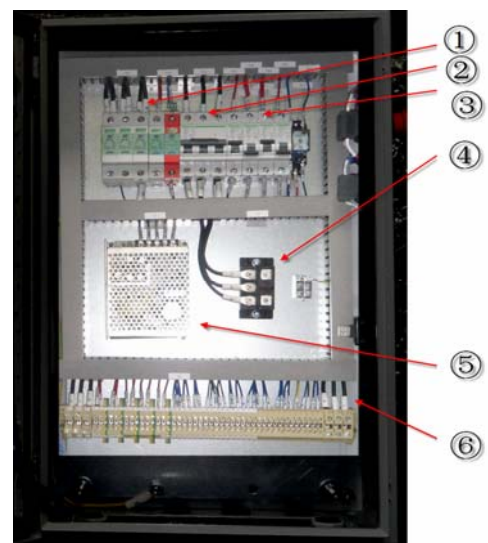
## 1.4 WICo Controller

- ①. WICo Lock
- ②. WICo Display: Setting system parameters and monitoring system state.
- ③. WICo emergency stop button: Push down to cut power supply and stop turbine. Using this will cause the mechanical brake to apply.
- ④. Inspection knob: usually used for annual inspection. There are two positions for this knob, "Run" & "stop". In the position "stop", the system will enter inspection mode. The turbine stops and will yaw to maintenance position. The normal running position is "Run".
- ⑤. RS232 serial port: Used to connect peripheral equipment like GPRS module.
- ⑥. USB port and Ethernet port: Use for Ethernet connection and other equipment which has a USB port. eg. 3G module, Wifi module.



### Inside WICo Box

- ① Surge protector module: It needs routine maintenance.
- ② Inverter input switch: Don't operate this switch when the turbine is running. Ensure the switch is on before starting turbine.
- ③ UPS switch:  
Switch 1: Nacelle power supply  
Switch 2: WICo power supply  
Switch 3: Dumpload power supply  
Note: When turbine is in "Run" state, it's forbidden to operate these switches. When turbine is in "Stop" state, the electrician can operate them.



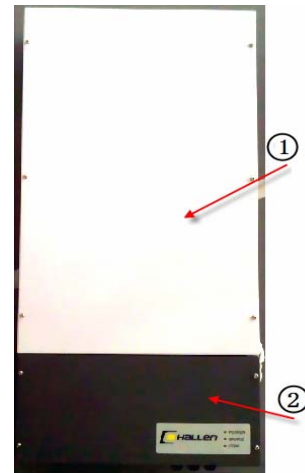
- ④ Rectifier: DC output can connect to inverter or battery charger directly.
- ⑤ DC power supply: Used for touch screen module.
- ⑥ Wiring terminal

## 1.5 Dumpload controller

Function: Consume overload power

- ① Resistance
- ② Dumpload controller

**Caution: Dumpload will get very hot when working. Please refer to P3.3.8-1 for installation instructions and space required around dumpload.**



## 1.6 Inverter(Grid-on)

Function: Transform power production from DC to AC in stable voltage and frequency.



Challengentec 5KW Grid tied Inverter



Power one 3.6KW Grid Tied inverter



Power one 6KW Grid Tied Inverter



Power one 10KW Grid Tied Inverter

## 1.7 Off-grid battery charge controller



## 1.8 Hydraulic Ram

Distance of travel: 910mm (19.6m tower)

915mm (11.6m tower)

Load: 37t (19.6m tower)

20t (11.6m tower)



## 1.9 Petrol driven hydraulic pump

Brand of Engine: Honda





## 1.10 Wireless module

voltage input: AC 100~240V(50~60Hz)

Maximum Distance: 500m

Outdoor waterproof craft



## 1.11 UPS



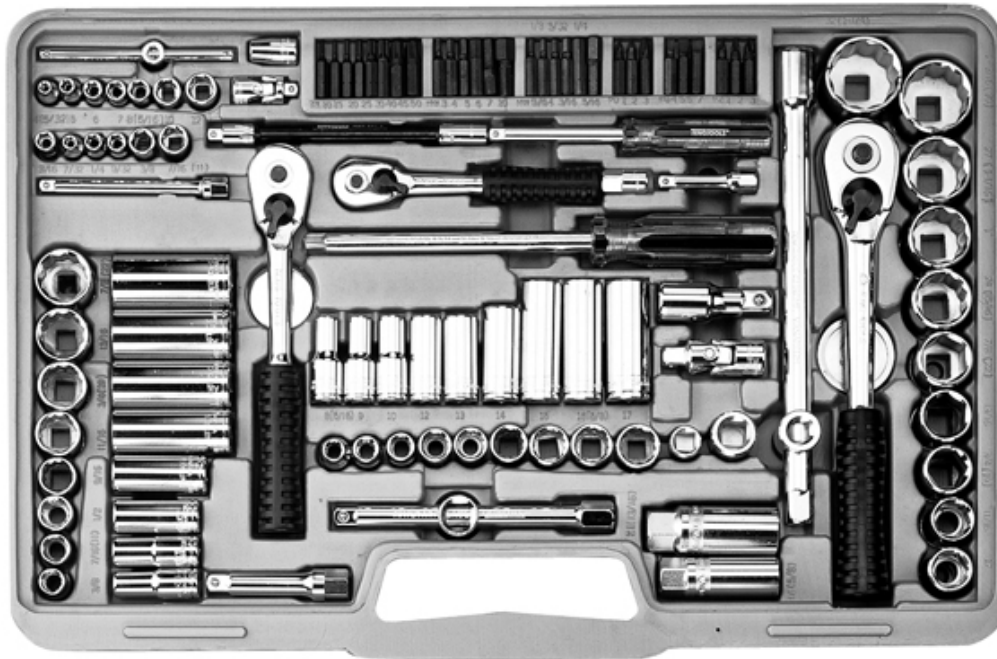
## 2 Foundation

WIPO provide design of foundation. Please refer to appendix1, 2 and 3.  
Please consult local construction company for other details.

## 3 Hardware Installation of WINForce

### 3.1 Installation Tools Required

Different size spanner, socket, bolts:



M30 bolts (3 / 4 drive socket) for fixing the foundation, 46mm socket.

M12 bolts for fixing the blades to the hub, 18mm socket.

M10 bolts for the side jacking plates on the hub, 16mm socket.

M16 bolts for fixing the turbine to the tower, 24mm socket.

Torque spanner to NM 675



Spirit level minimum length 1m or equivalent



Tirfor winch with pulling force 3T minimum  
cable length 25m



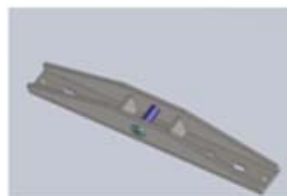
For all fixings to threaded holes use thread  
lock to specification LOC242



### WINForce tower assembly tool



Assembly tool  
(bottom) X1



Assembly tool  
(top) X1



ShackleX1



Tirfor 3Ton X1

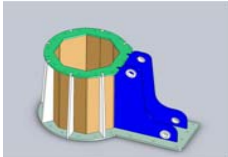
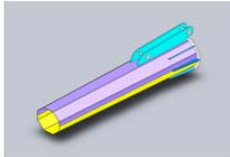


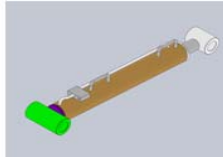
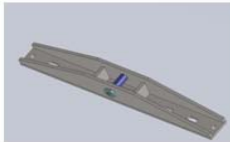
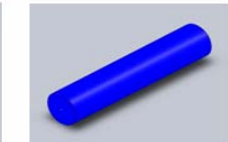



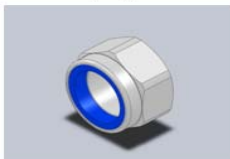







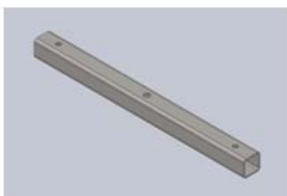






Tirfor Wire rope

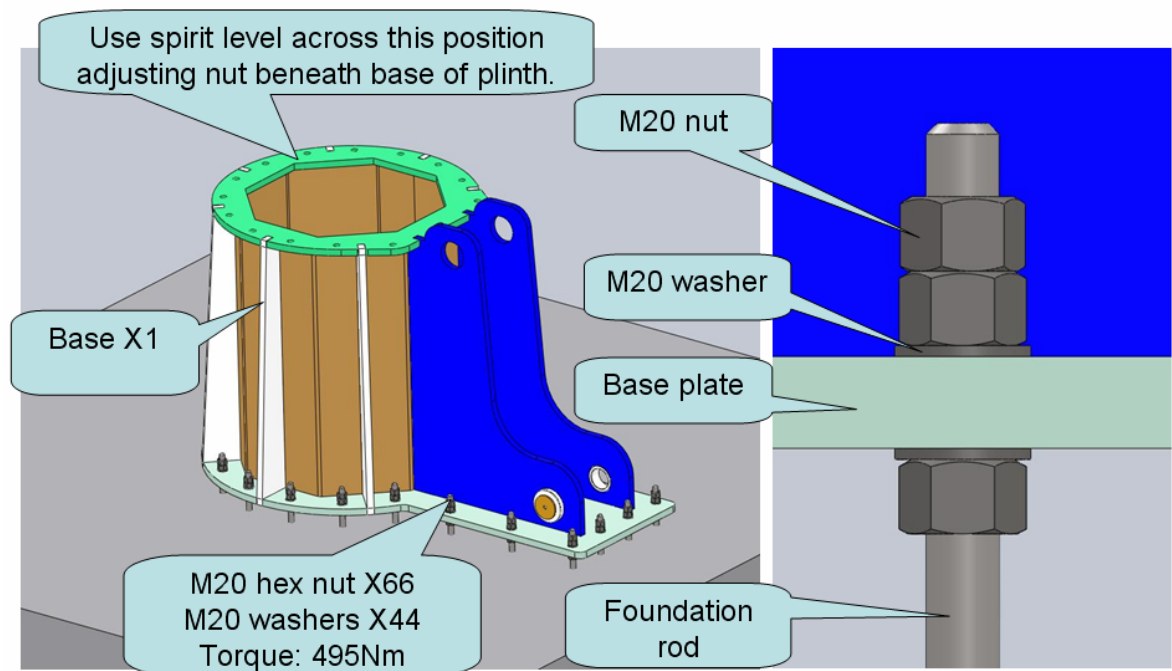
## 3.2 Tower Installation

### 3.2.1 11.6M tower Installation

#### 2.2.1.1 Material list

				
Base X1 (710kg)	First Section X1 (898kg)	Second Section X1 (372kg)	Top Section X1 (282kg)	Hydraulic Ram X1 (114kg)
				
Assembly tool (bottom) X1	Assembly tool (top) X1	Pin1 X2	Pin2 X1	End cap X6
				
M20x90 bolts X15	M20 lock nuts X15	M20 hex nut X66	M20 washer X74	M12 x20 bolts X6
				
Tirfor 3Ton X1	Tirfor Wire rope	ShackleX1	M16x50 bolts X2	
				
M16 nuts X6	M16 washer X2	Drawing steel tube X1	Drawing Screw Bolt X1	
				
M12x90 bolt X2	M12 washer X2	M12 spring washerX2		

### 3.2.1.2 Base Installation

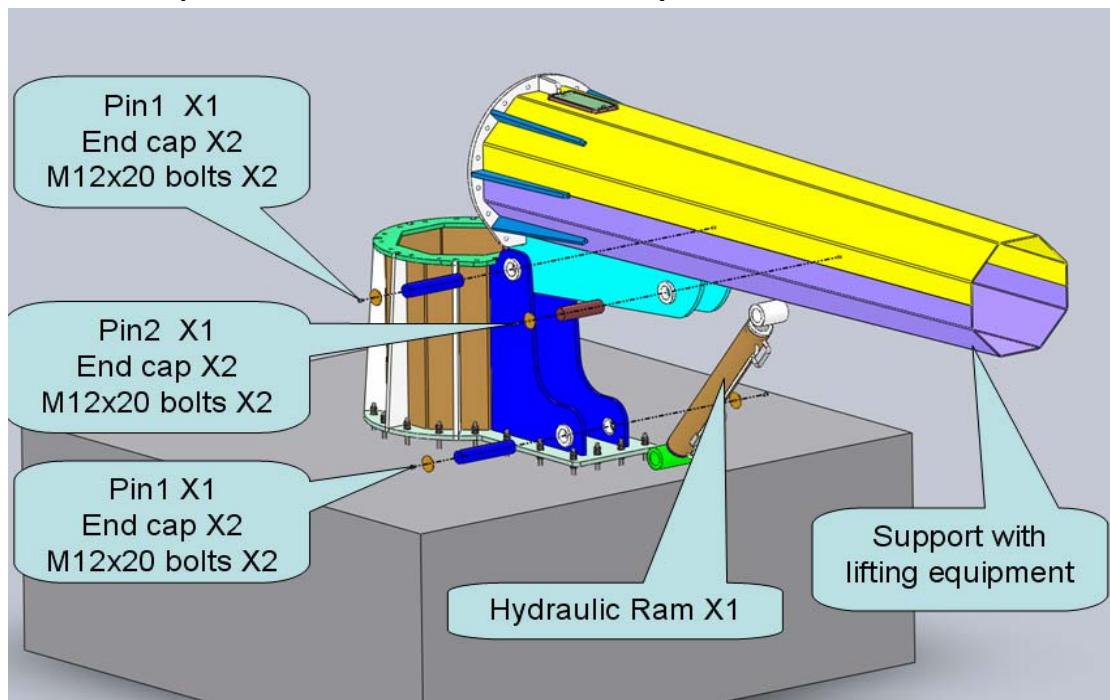


### 3.2.1.3 Hydraulic Ram Installation

First, install Pin1 to connect base and tower section.

Second, install pin1 to connect base and hydraulic ram.

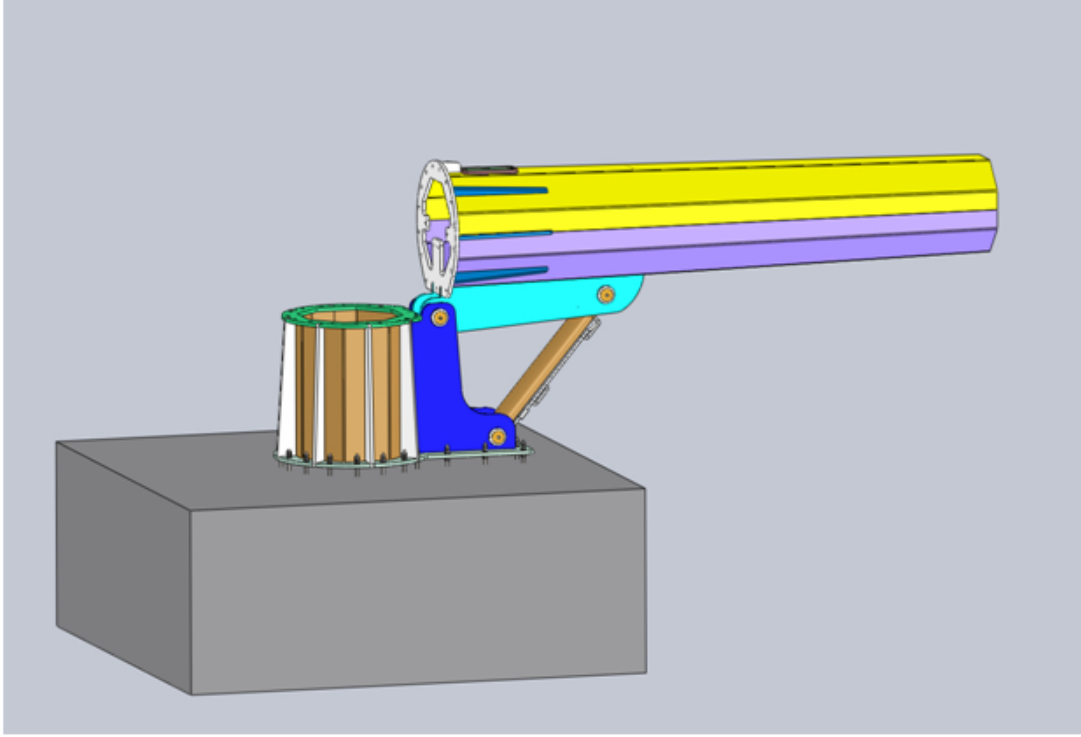
Third, install pin2 to connect tower section and hydraulic ram.



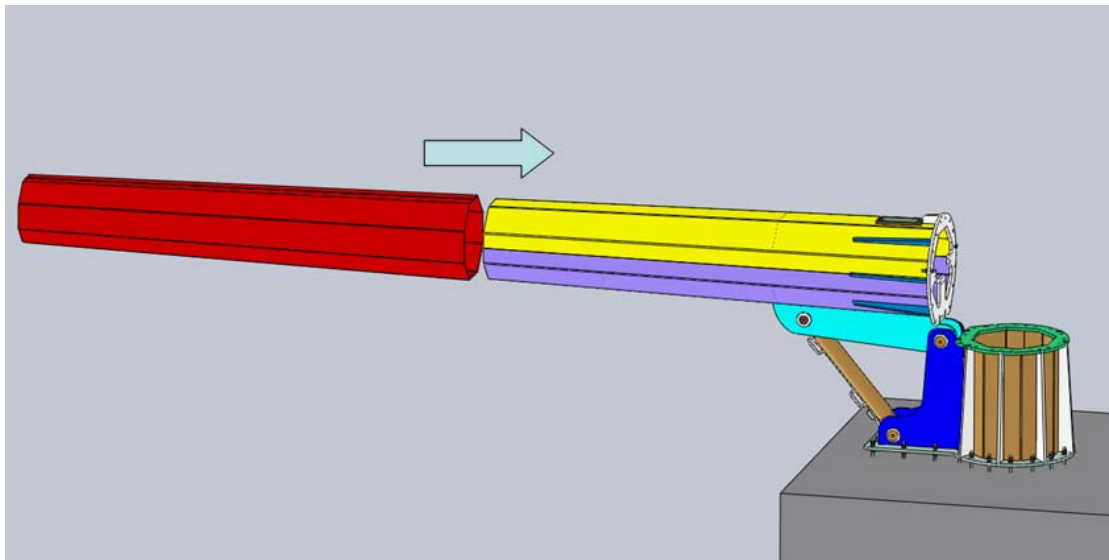


### 3.2.1.4 Tower Assembly

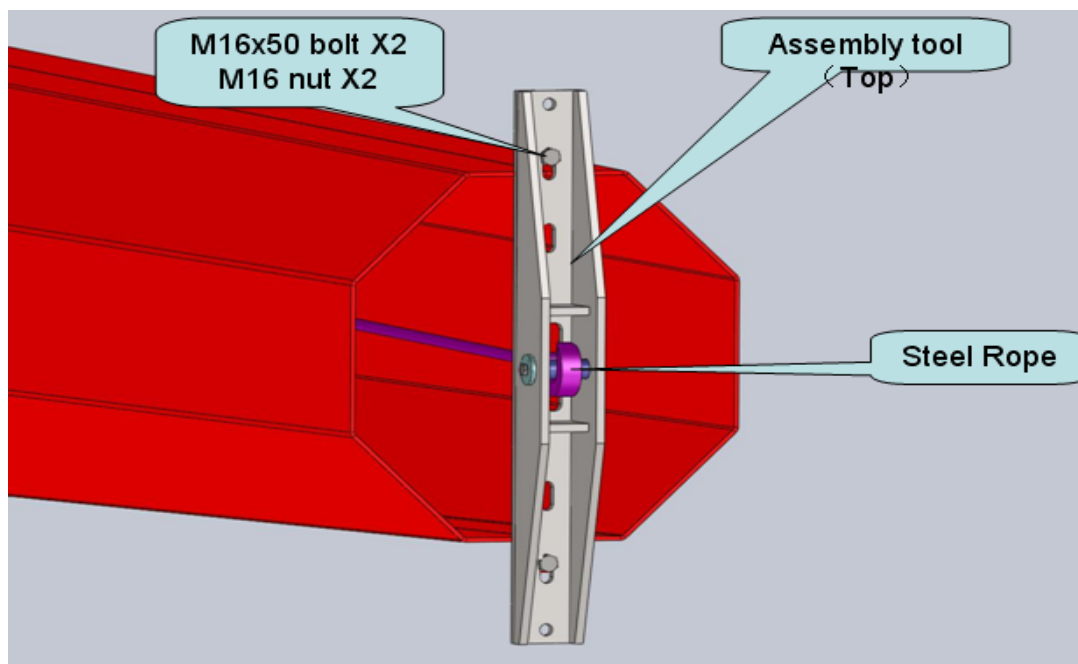
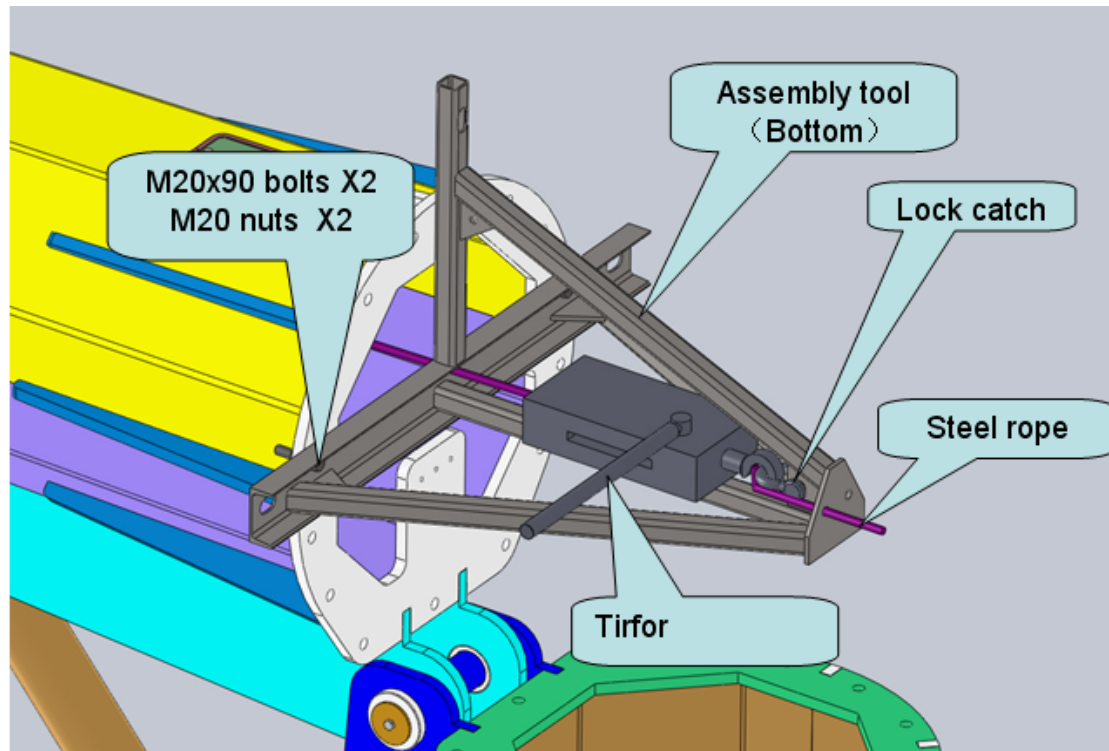
Use the hydraulic ram to adjust the position of first section tower. Make sure it is horizontal.



Use lifting equipment to connect two tower sections

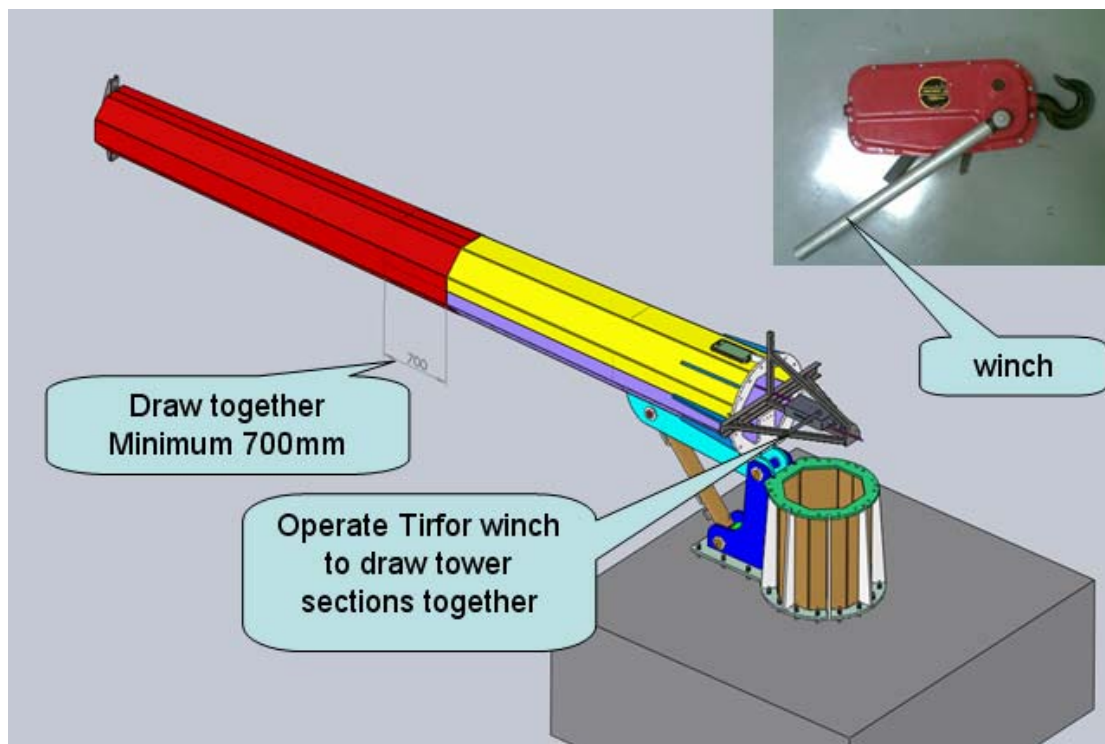


Fixing assembly tools both bottom and top.



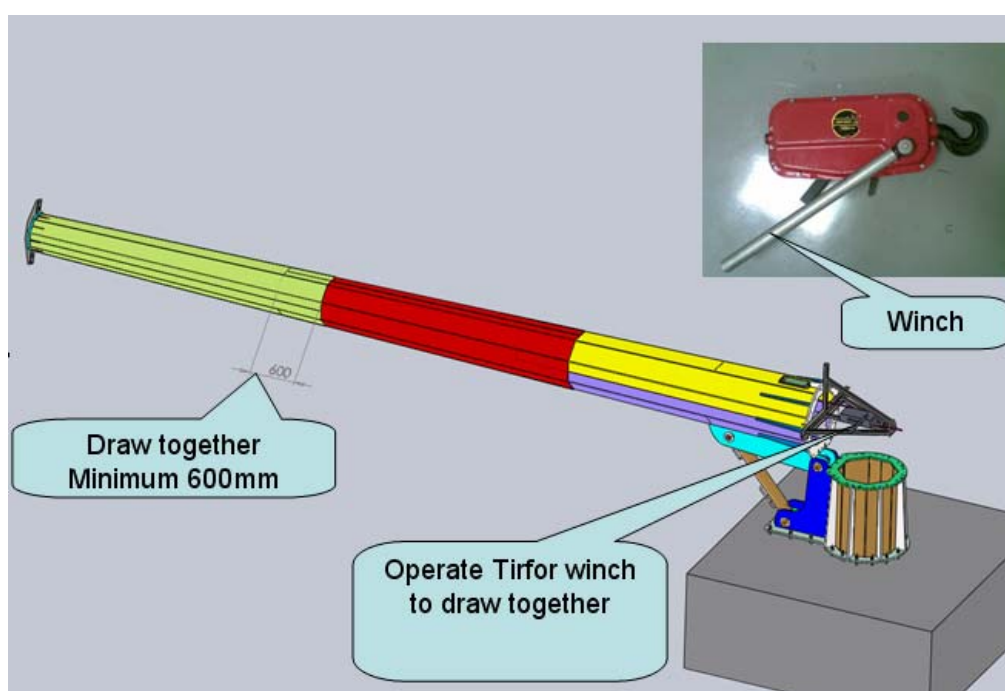


Operate tirfor winch to draw tower sections together.



NOTE: It is very important that tower sections are drawn together individually  
It is also essential that the tower sections are assembled using a tirfor winch and the WINForce tower assembly tool so that the pull is centrally through the tower  
Pulling the sections together from the side of the tower may result in the incorrect alignment of the sections and will invalidate warranty

Repeat the same operation to assembly the top section of tower.



### 3.2.1.5 Lay cables of turbine throughout the tower

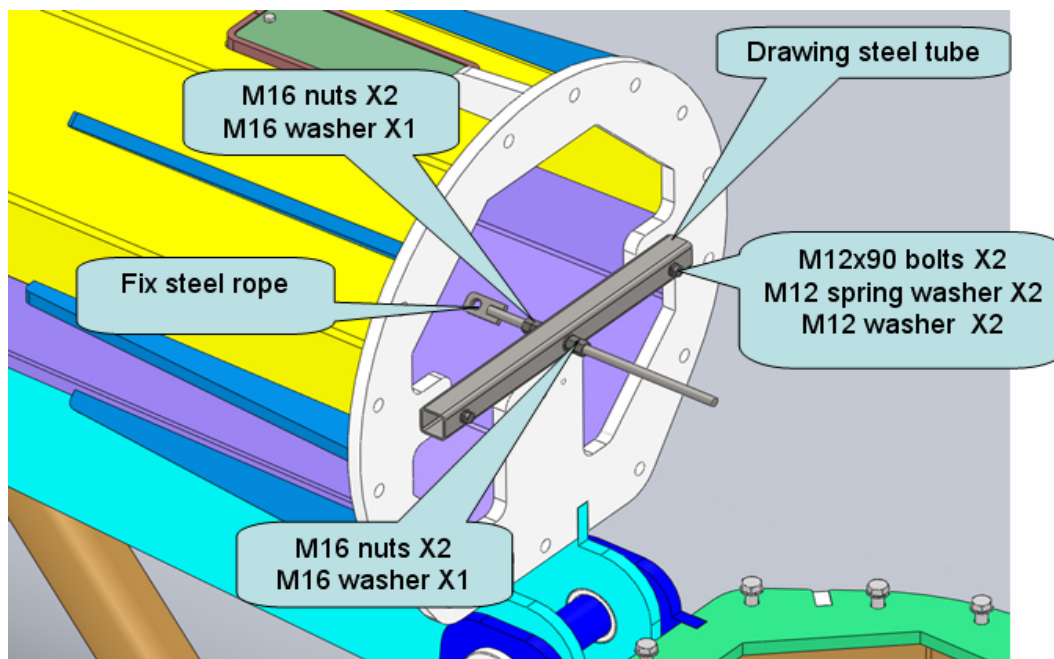
The cables of turbine (power cable and control cable) are shown as below:



After drawing tower sections, we can use assembly tool to lay turbine cables through whole tower. Connect turbine cable with steel rope (one part of assembly tool), then draw the steel rope at bottom side of tower, the turbine cable will be drew from top to bottom.

### 3.2.1.6 Fixing drawing steel tube

After drawing tower sections, dismantle assembly tools and install drawing steel tube at the bottom of tower.

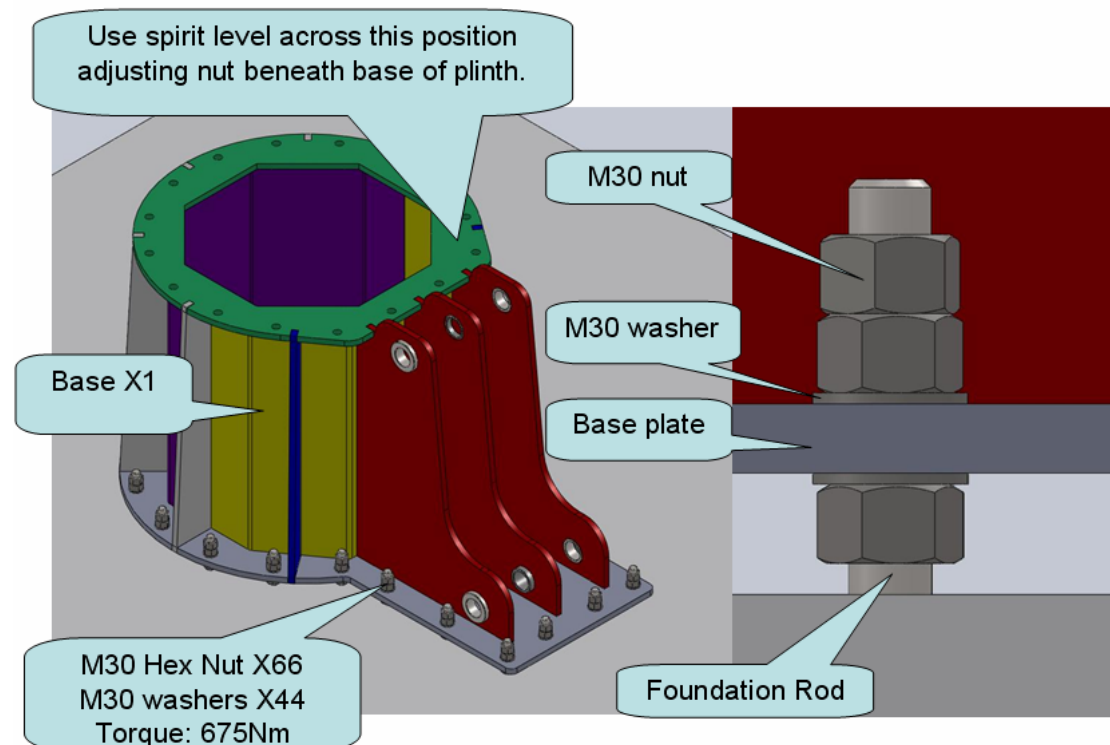


## 3.2.2 19.6 m tower installation

### 3.2.2.1 Material list

				
Base X1 (1298kg)	First section X1 (1788kg)	Second section X1 (1298kg)	Third Section X1 (849kg)	Top Section X1 (506kg)
				
Hydraulic Ram X2 (152kg)	Pin1 X1	Pin2 X1	Pin3 X1	End cap X6
				
M30x100 bolts X16	M30 lock nuts X16	M30 Hex Nut X66	M30 washer X76	M12 x20 bolts X6
				
Tirfor 3Ton X1	Steel rope for Tirfor	Shackle	M16x50 bolts X2	M16 nuts X6
				
M16 washer X2	Drawing steel tube X1	Drawing screw bolt X1	Assembly tool (Bottom) X1	
				
Assembly tool (Top) X1	M12x90 bolt X2	M12 washer X2	M12 spring washerX2	

### 3.2.2.2 Base installation

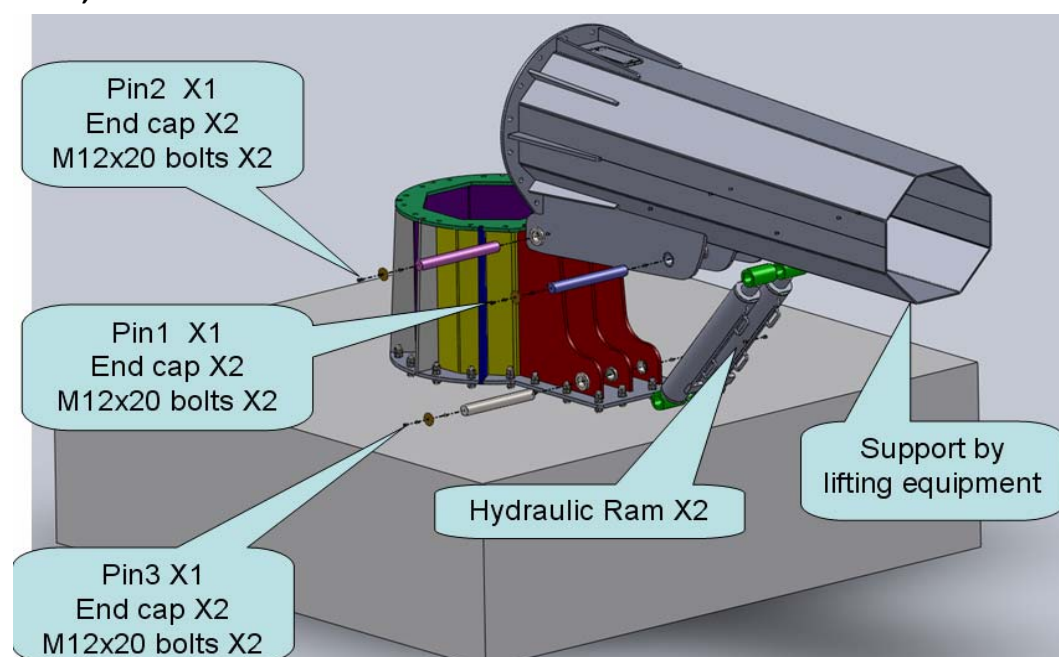


### 3.2.2.3 Hydraulic Rams Installation

First, install Pin1

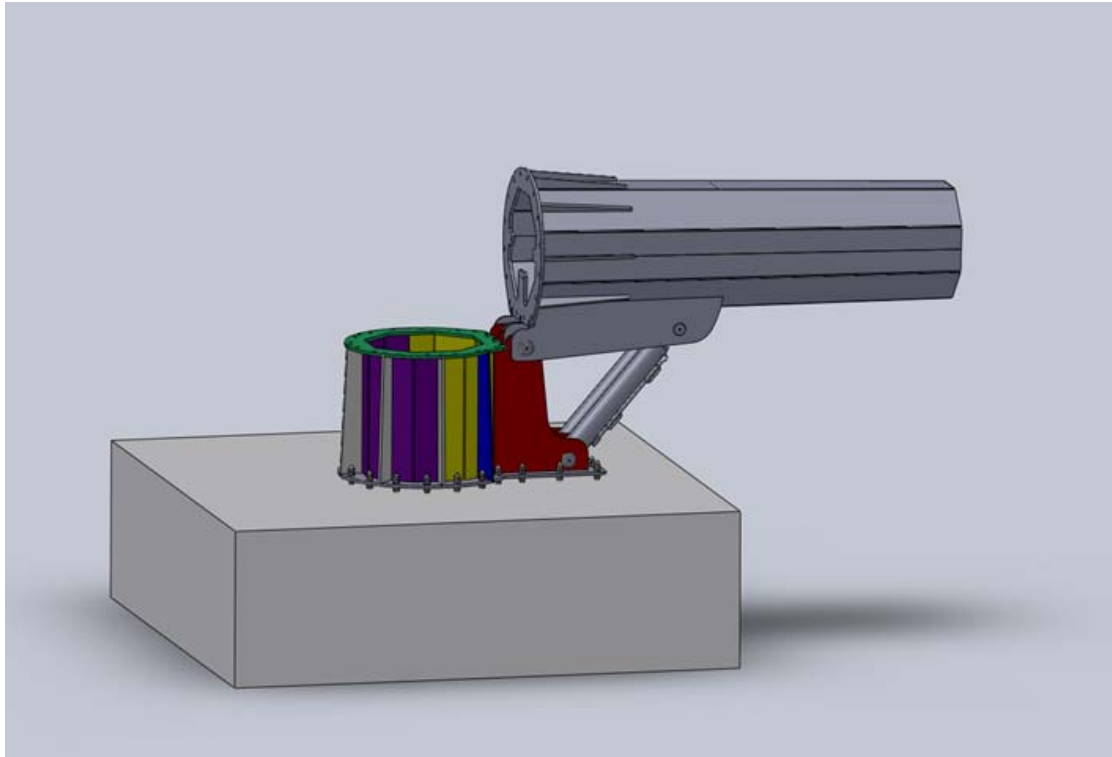
Second, install Pin3

Third, install Pin 2

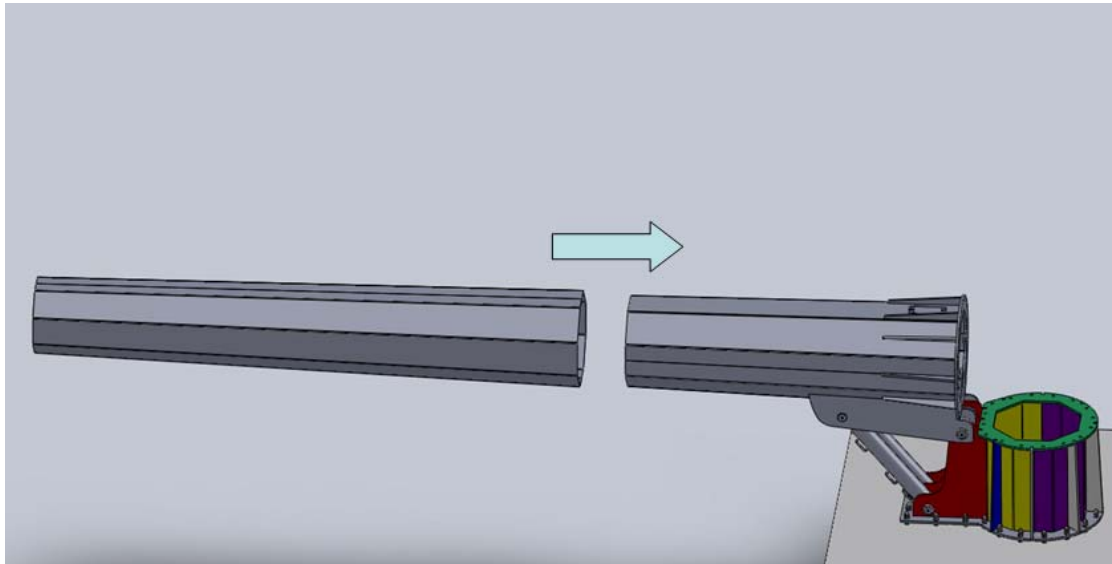


### 3.2.2.4 Tower assembly

Use hydraulic ram to adjust the position of first section tower. Make sure it is horizontal.

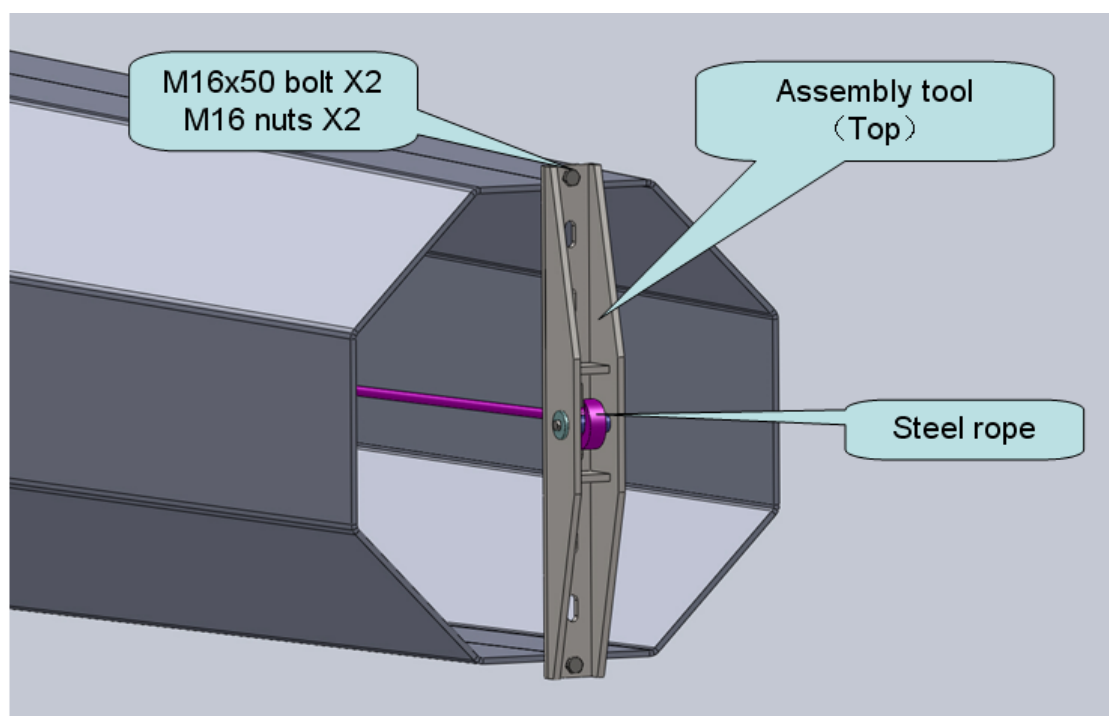
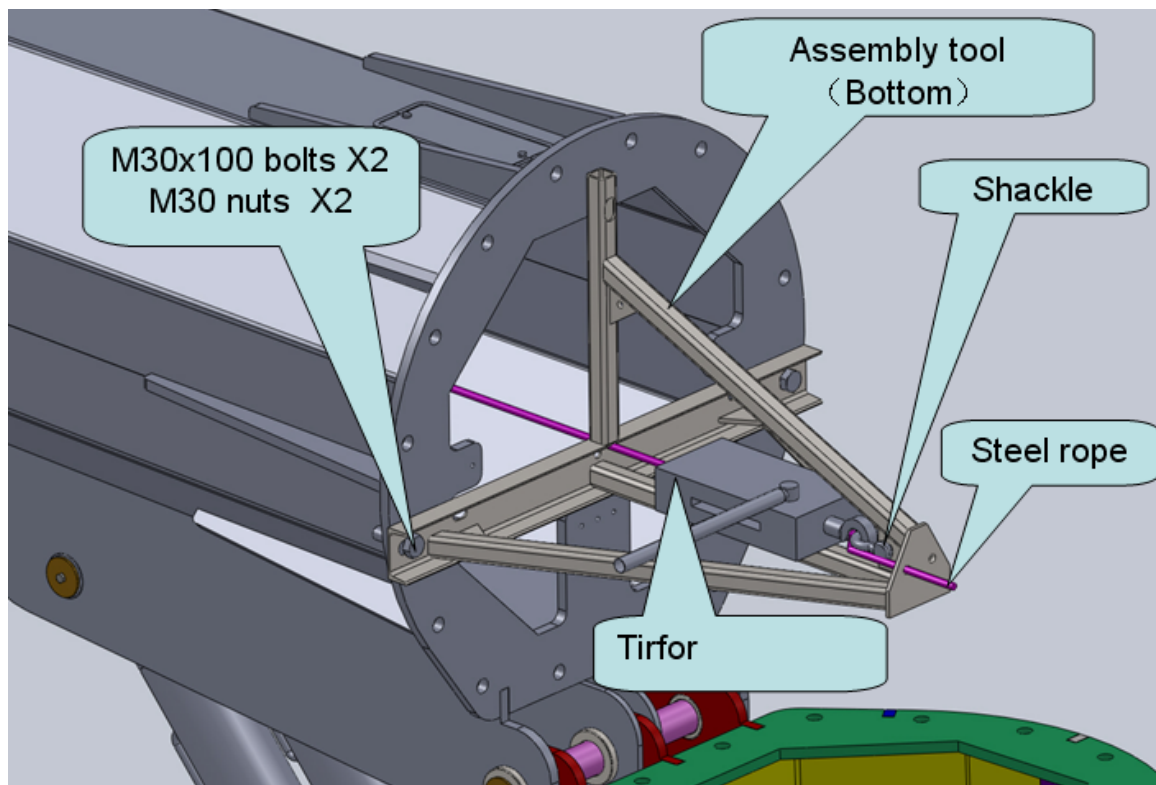


Use lift equipment to connect two tower sections

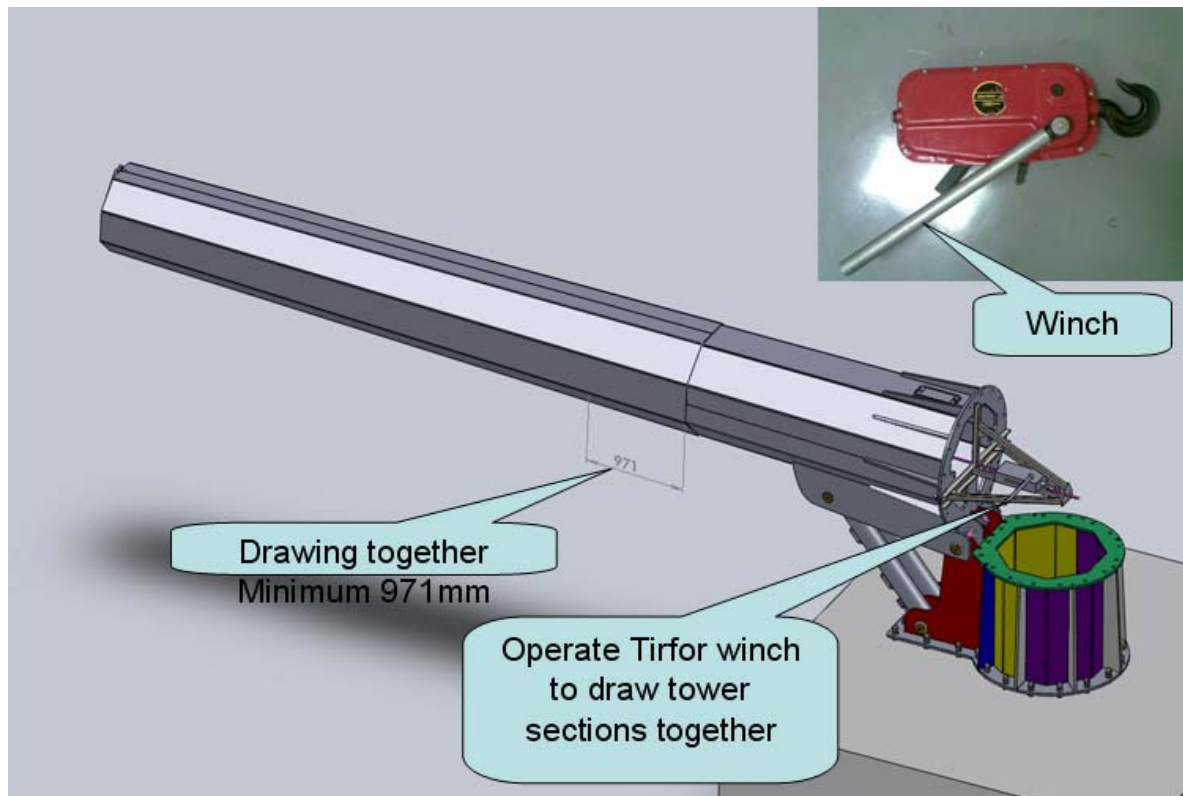




Fixing assembly tools both bottom and top.

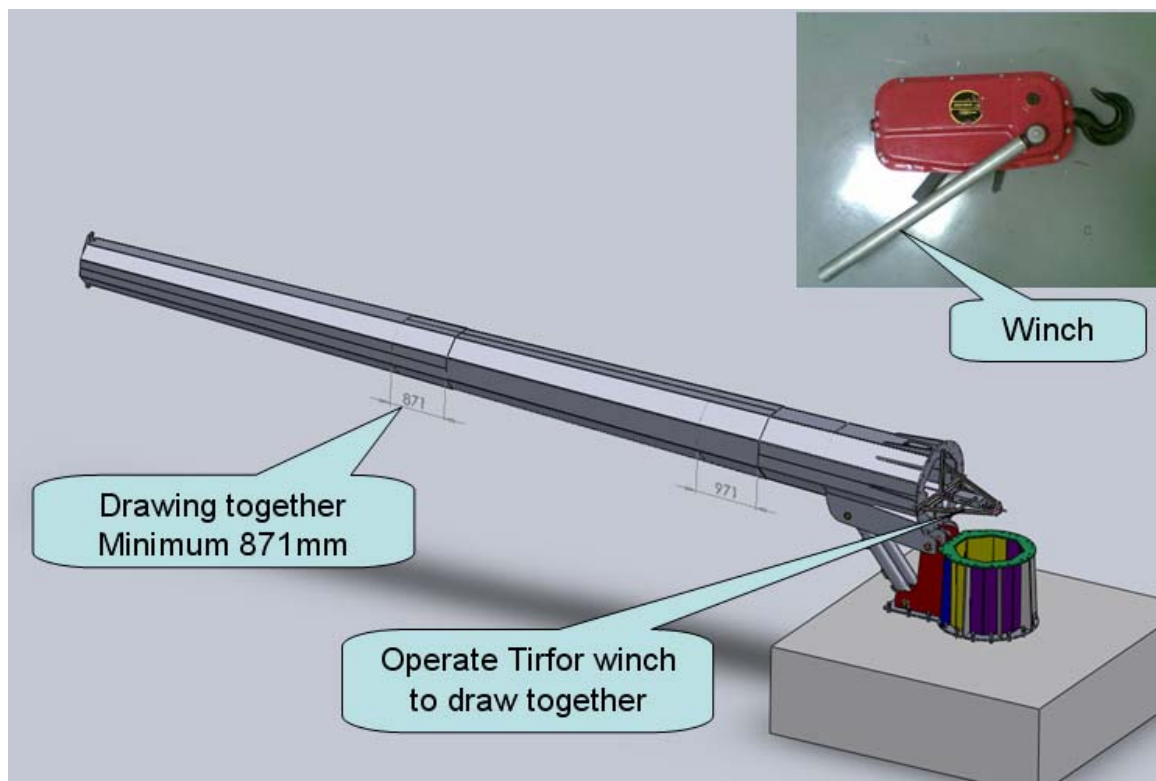


Operate tirfor winch to draw tower sections together.

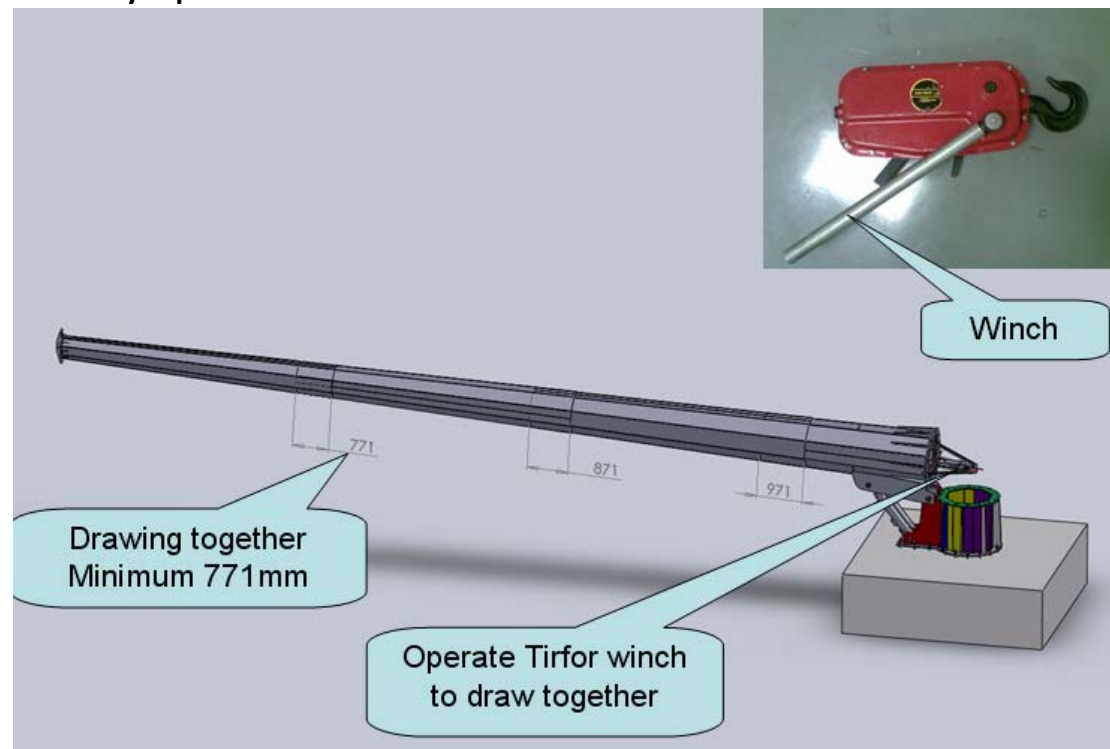


Repeat the same operation to assembly the third and top section of tower.

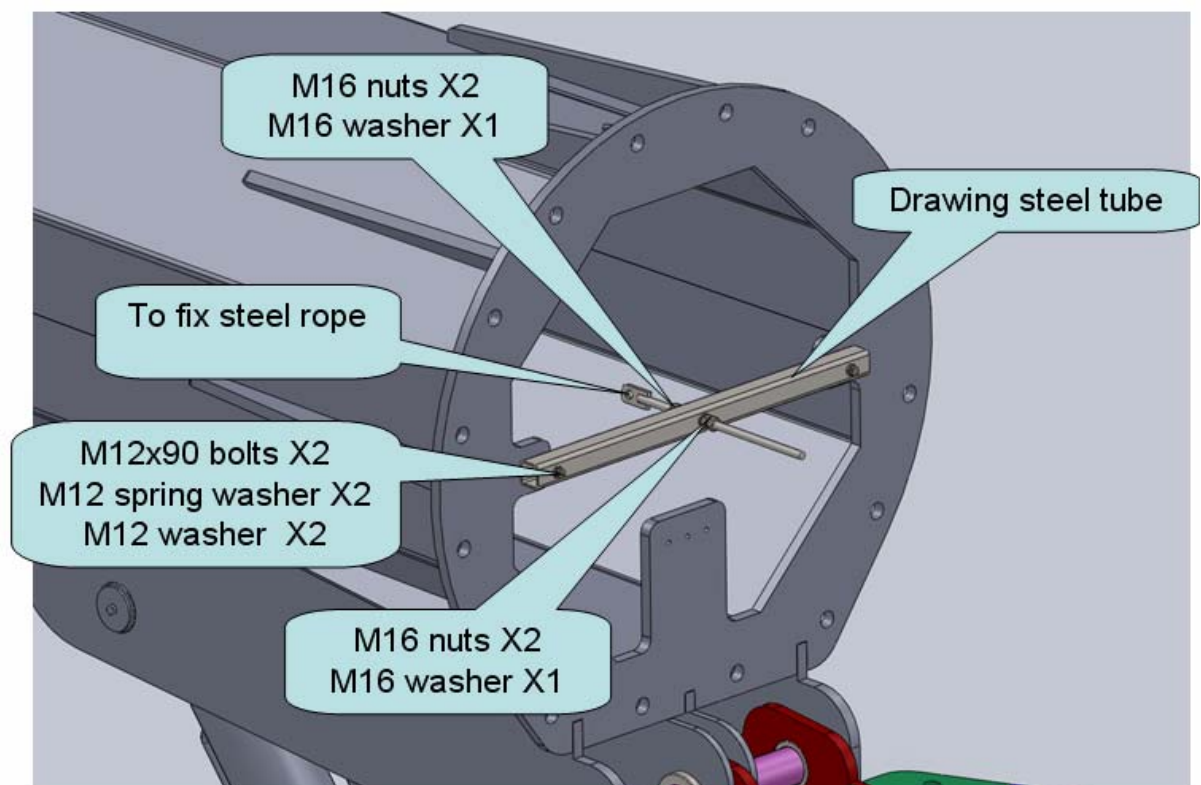
### Assembly third section:



### Assembly top section:



### 3.2.2.5 Fixing drawing steel tube



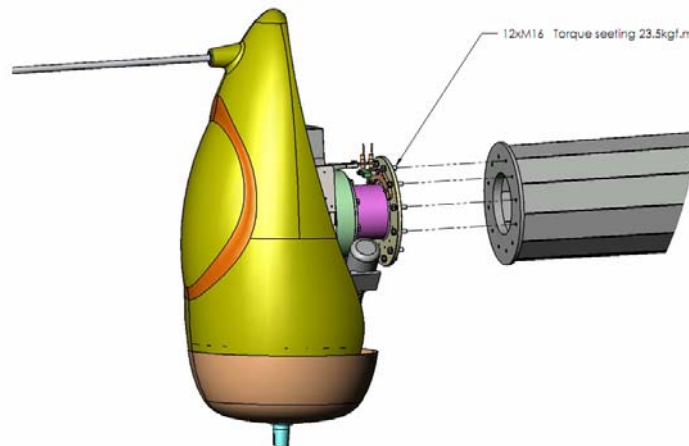


### 3.3 Nacelle Fixing

The recommended method is to use lifting forks to offer the nacelle to the tower

Use the rope in the centre of the tower to draw through the 3 cables.(Refer to chapter 3.3.1.5)

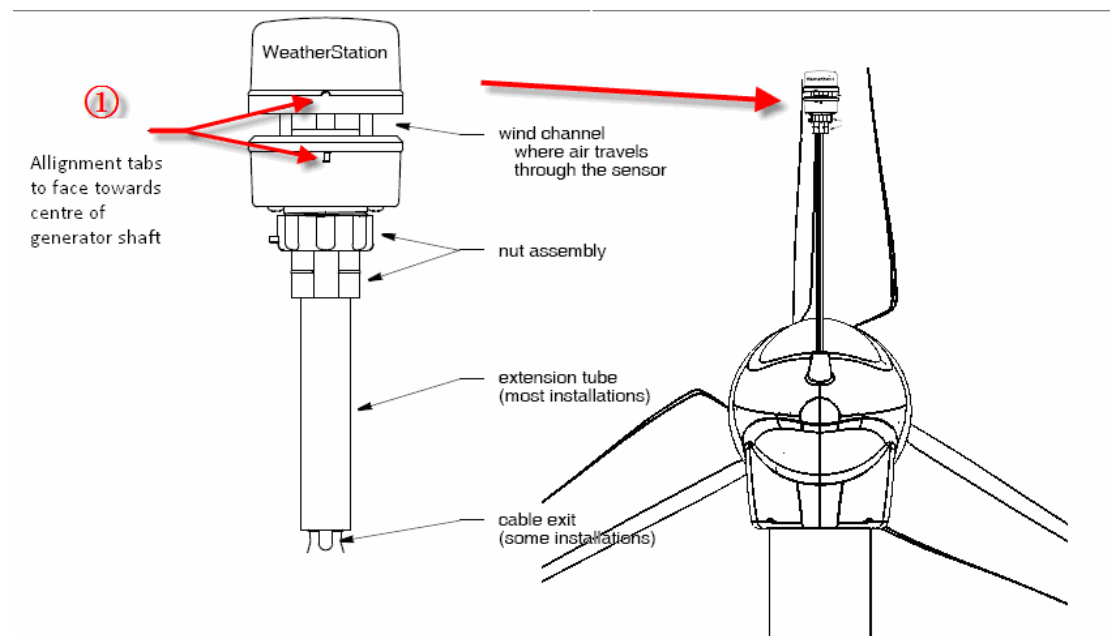
Use 12 X M16 bolts (24mm Spanner, 246 NM) supplied to fix nacelle to tower.



#### NOTES:

Do not stand, sit or place any weights on the tower in the horizontal position

### 3.4 Ultrasonic Fixing



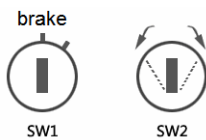
As showed in the picture above, the mark ① of the anemometer should point along the centre line of the nacelle .

## 3.5 Hub fixing

### Nacelle control box

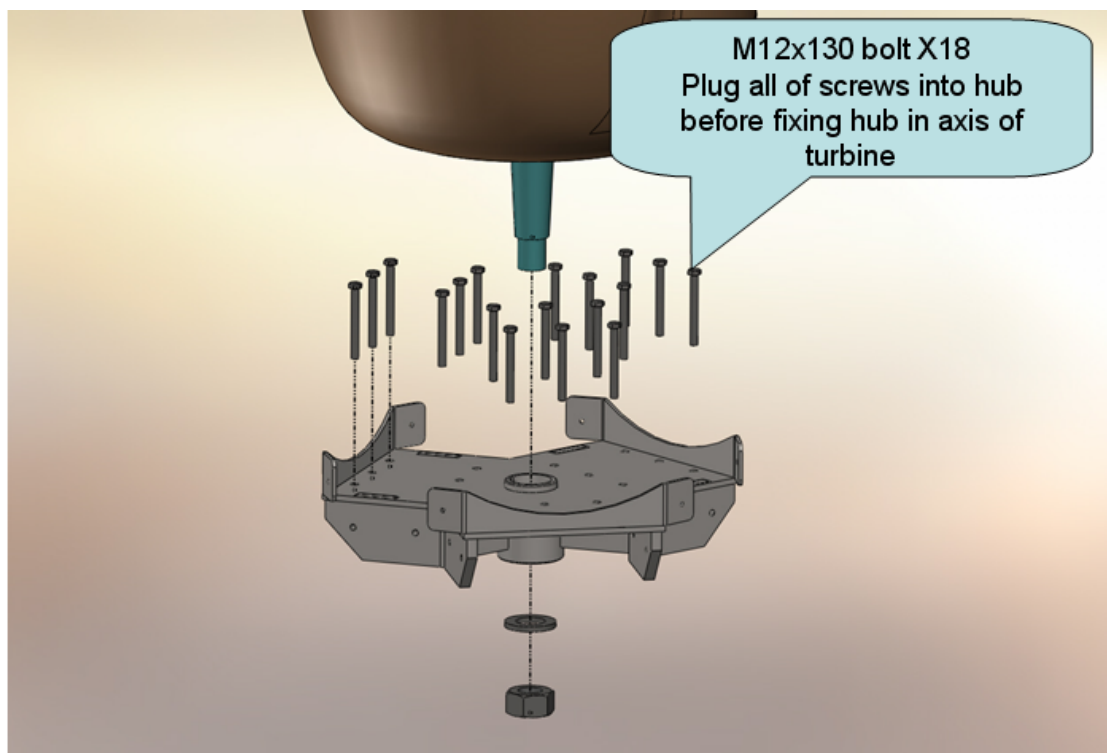
This box is installed in nacelle (Please refer to chapter 1.1) .At left side of box, there are two knobs.

- ① Manual Mechanical Brake controller
- ② Manual Yaw



These two knobs are used to adjust position of turbine and blade when installation, inspection and commissioning.

Before installing hub, use knob 2 to adjust the position of turbine. Ensure that the turbine is vertical with ground.



### 3.6 Blade Fixing

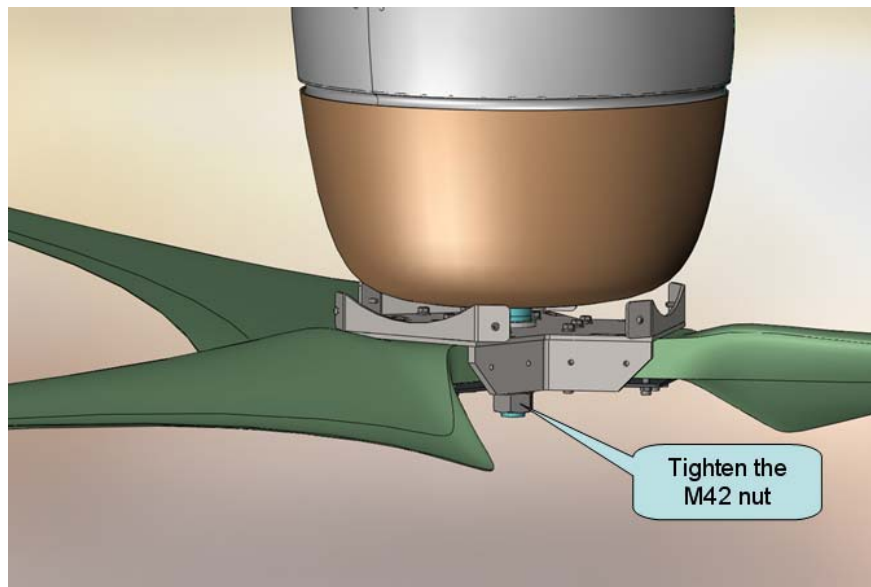
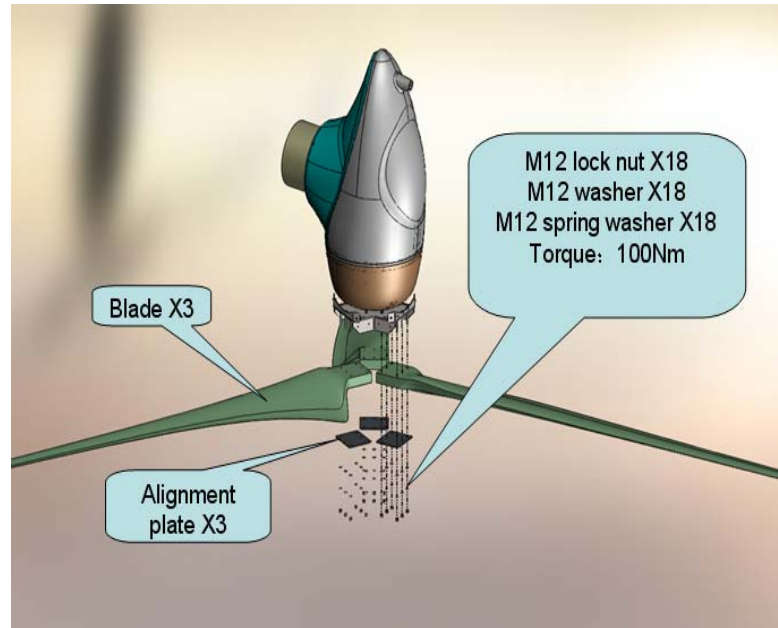
After correcting position of the nacelle, fix the blades one by one.

Use only WINForce blades – as supplied as a set – do not mix blades from different sets

Fix as shown for correct direction of rotation

Use only stainless steel nuts and bolts supplied.

Initially torque to 99NM  
Fix side alignment plates to hub



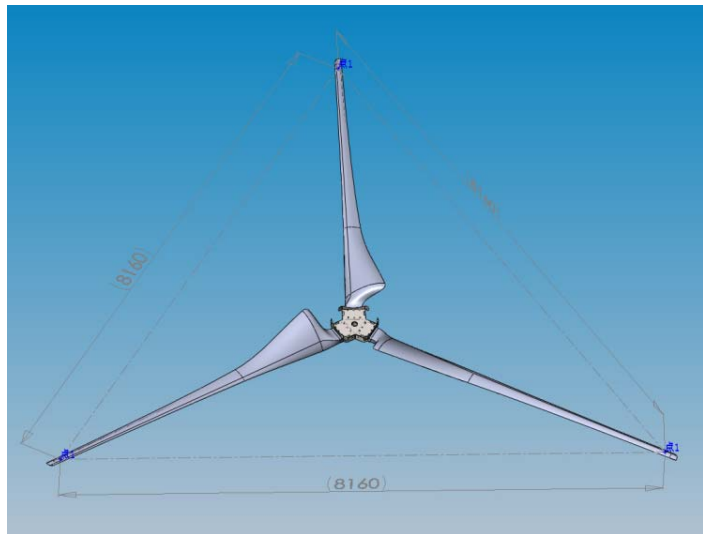
Use side alignment plates to ensure exact blade tips are exactly the same dimension apart

There is a mark point in tip of each blade for measuring distance between blades.

Check blade tip measurements and correct if necessary

Record on installation record blade tip dimensions

(Needs installation record which the installer signs off and sends to WIPO: Address, customer name, contact details, date of concrete pour, date of fitting tower, date of fitting nacelle / blades/ commissioning date. Blade tip dimensions, serial number of chassis, blades, generator. )



## 3.7 Raise Tower

The operation of petrol driven hydraulic pump, please refer to user manual of pump.

**Procedure of raising tower:**

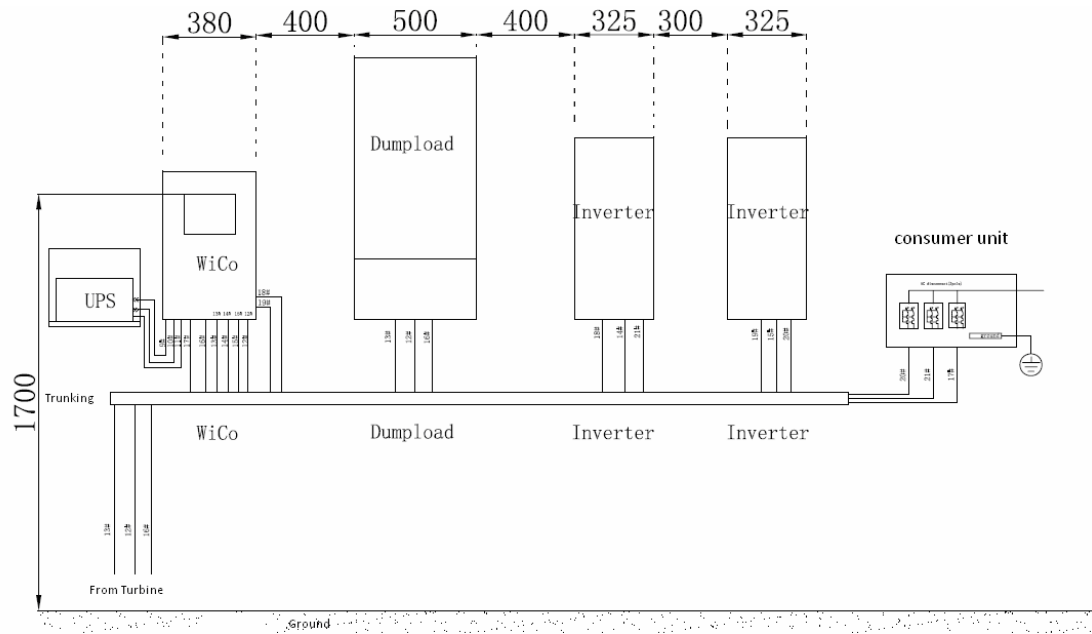
1. connect oil tube between pump and hydraulic ram
2. start petrol driven hydraulic pump
3. Turn the pump to “push” mode, then the tower will be raised smoothly by hydraulic ram.
4. Ensure that there is nobody under the tower when raising. Please keep away from tower.

**Before raising the tower check:**

1. Ultrasonic wind sensor, refer to 3.3.5 Ultrasonic Fixing
2. Check yaw motor and mechanical brake. Refer to 3.3.7 Hub Fixing(With blade)
3. Check the communication state between WICo and Main control board in nacelle. Make sure that we can read the dynamic value of main control board from WICo.(All operation here refer to part of WICo operation guide)
4. Check the battery switch in nacelle control box. Make sure that battery switch is on.

## 3.8 In-house Installation

The WiCo and dumpload controller must be installed indoors. Inverters can be mounted outside if IP65. The suggested layout refers to P3.3.8-1. The space between each unit shown in P3.3.8-1 is the minimum suggested value.



P3.3.8.1

Please select the suitable cable supplied by customer according below cable specification form.

Sectional Area	The metric system	6mm <sup>2</sup>	10mm <sup>2</sup>	16mm <sup>2</sup>	25mm <sup>2</sup>
	American wire gauge	AWG9	AWG7	AWG5	AWG3
4% voltage drop max wire (20 °C)	The metric system	108m	180m	288m	450m
	American wire gauge	118 yard	197 yard	315 yard	492 yard

# 4 System electrical wiring

## 4.1 The whole system wiring

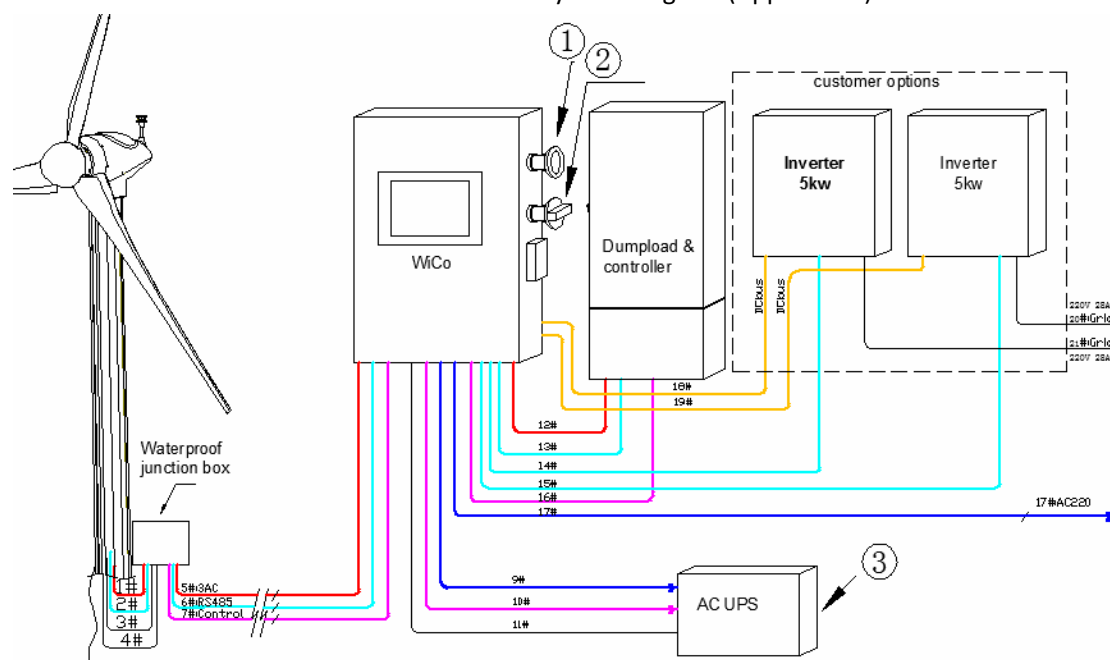
**Note:** In order to protect the electrical system, there should be no connection of earth from any part of the electrical cables to any part of the tower/turbine.

Make all electrical connections in the property according to the electrical schematics.

Install cables between turbine and property according to local regulations.

- Appendix 4——Single phase Challengtec and Inverter with Built In Isolation Transformer
- Appendix 5——Single phase Power One
- Appendix 6——3 Phase Challengtec and Inverter with Built In Isolation Transformer
- Appendix 7——3 Phase Power One (2 x 6kW)
- Appendix 8——3 Phase Power One (3 x 3.6kW)
- Appendix 9——System wiring diagram
- Appendix 10——Detail connection diagram

P4.4-1 System diagram (Appendix 9)

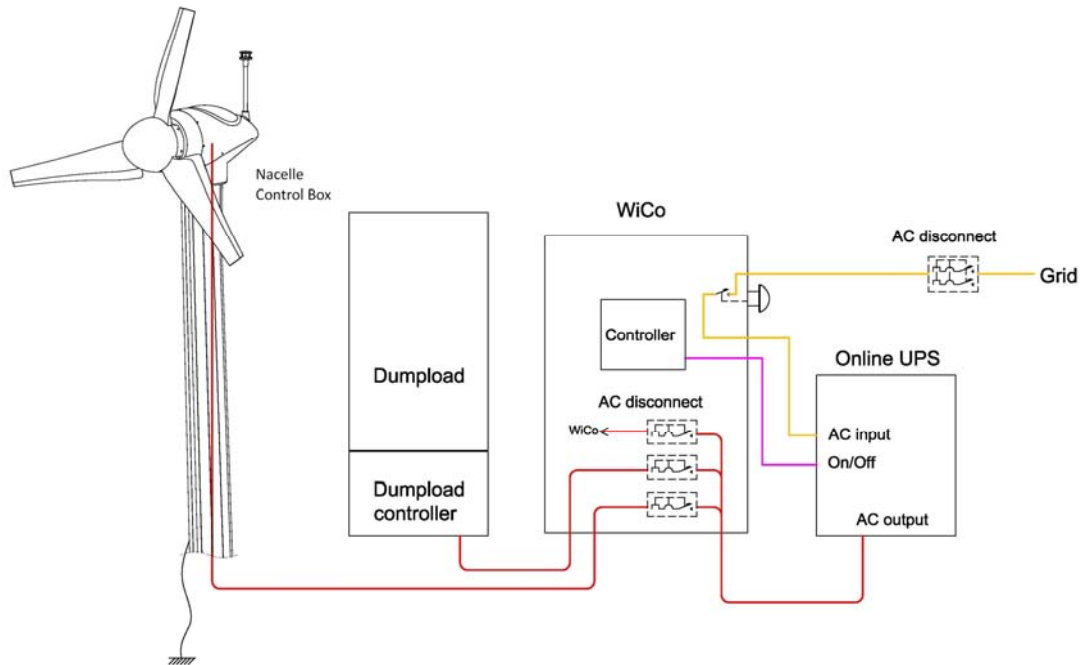


### Cable List

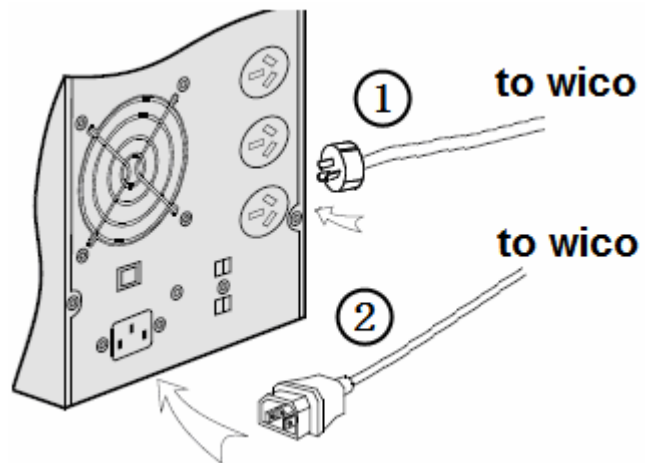
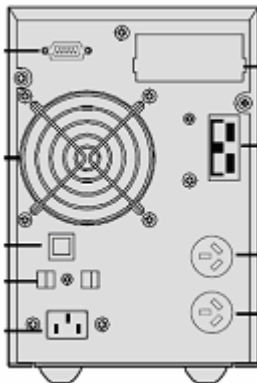
Cable No.	mm <sup>2</sup>	American standard	Length	Remark	
1#	3x6.0	3xAWG9	<=22m	Supplied by Wipo	Power cable
2#	2x2x0.5 STP	2x2xAWG21	<=22m	Supplied by Wipo	Control cable
3#	3x1.5	3xAWG15	<=22m	Supplied by Wipo	Power cable

4#	4x0.75	3xAWG18	<=22m	Supplied by Wipo	Control cable
5#,8#	Cable size according to distance and local regulations for voltage drop		According to local conditions	Supplied by user	Power cable
6#	2x0.5 STP	2x AWG21 STP		Supplied by user	Control cable
7#	3x1.5	3xAWG15		Supplied by user	Power cable
9#	3x1.5	3xAWG15		Supplied by user	Power cable
10#	3x1.5	3xAWG15		Supplied by user	Power cable
11#	3x2x0.2 STP	3x2xAWG23 STP		Supplied by user	Control cable
13#,14# , 15#	3x2x0.2 STP	3x2xAWG23 STP		Supplied by user	Control cable
12#	3x6	3xAWG9		Supplied by user	Power cable
16#	3x1.5	3xAWG15		Supplied by user	Power cable
17#	3x1.5	3xAWG15		Supplied by user	Power cable
18#,19#	2x6	2xAWG9		Supplied by user	Power cable
20#,21#	3x6	3xAWG9		Supplied by user	Power cable

## 4.2 Power supply diagram



Online UPS (AC220V)



- ①UPS Output, Connect to WICo  
②UPS Input, Connect to WICo  
Refer to Appendix 10



## 4.3 RS485 communication connection

### P4.1-4 WINForce RS485 diagram

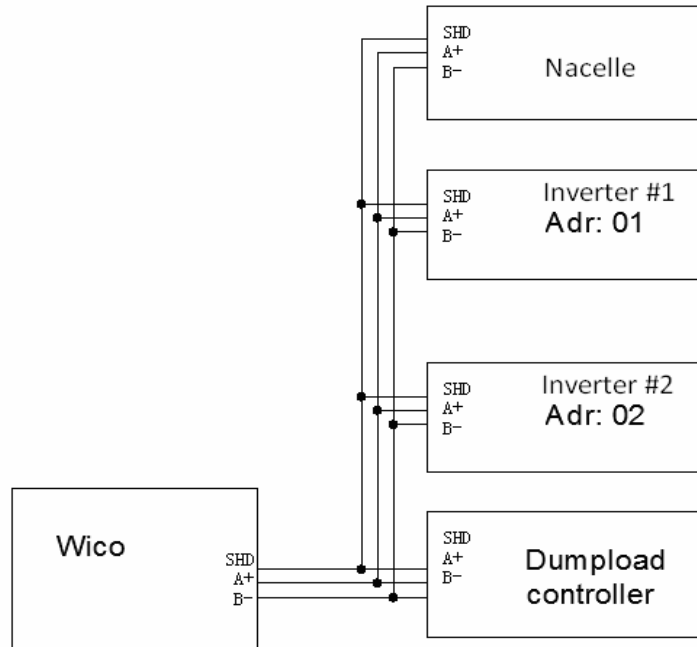
WINForce 10KW uses RS485 Communication bus (9600Bps, 8, n, 1) .

Connect as shown in diagram.

Set communication address of Inverter#1 to 01.

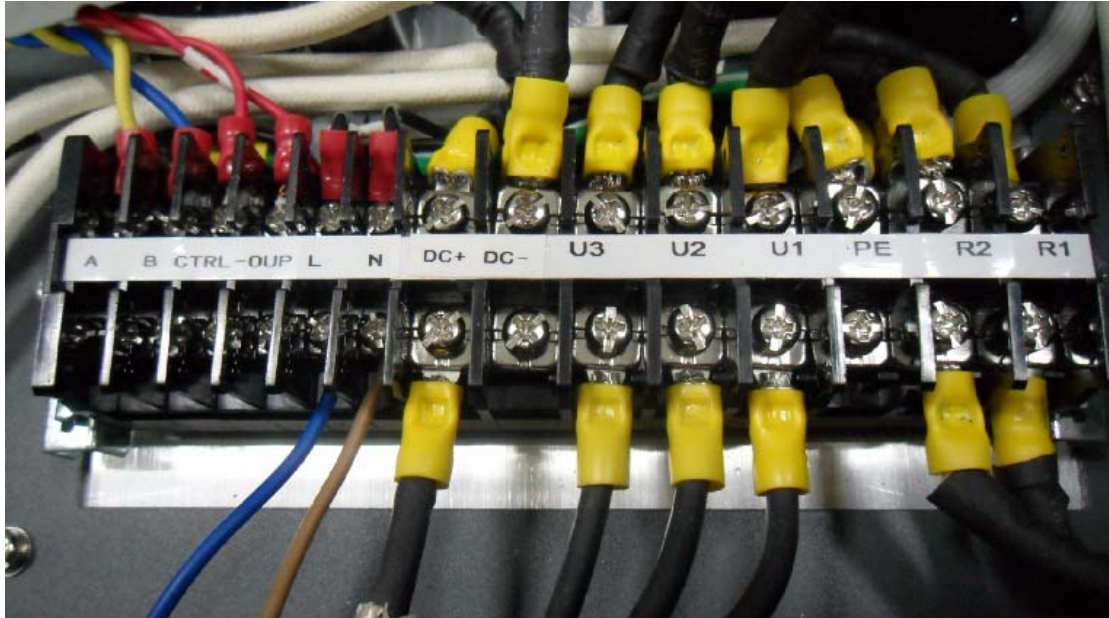
Set communication address of Inverter#2 to 02.

Refer to inverter manual for setting of communication address.



**Caution:** The 485 communication cable must use STP(Shielded Twisted Pair ), 120  $\Omega$  . And the connections order should follow diagram.

## 4.4 Dumpload controller connection terminals



Terminal Define:

A, B : RS485 Serial Communication

CTRL\_OUP: Alarm output terminal

L, N : Power input

U1, U2, U3: generator input

PE: Equipment grounding

R2, R1: connect to resistance

# 5 Commissioning

## 5.1 Installation inspection

Before connecting power supply, check all cable connections are correct.

Preparation before power on:



1. About UPS, check correct connection of L&N cable.
2. Turn **Run/Stop button (Button 2)** to "STOP" position
3. Push down **emergency button (Button 1)** to disengage.

## 5.2 Power on procedure

After system wiring finished, please follow below steps to power on system..

1. Turn On **AC disconnection switch** in user's consumer unit;
2. Turn on AC disconnection switch in WICo controller.
3. Release Emergency button. WICo box supplies power to UPS. Light of UPS will flash and become constant after 3 seconds.
4. After UPS running normally, power on dumpload, nacelle in turn.
5. Turn Run/Stop button to "RUN" position.

## 5.3 Mechanical Brake Testing

Actually, this testing should be done before raising tower.

Apply mechanical brake manually. Turn the blade to confirm if the brake has already applied or not.

Release mechanical brake and confirm again.

## 5.4 Power curve setting

Different configuration of inverter has different power curve.

### 1. 1X 10KW inverter configuration

DC. Volt.	Output Power
Vdc.	W
80.0	386.0
94.0	614.0
107.0	916.0
120.0	1304.0
134.0	1789.0
147.0	2381.0
160.0	3091.0
174.0	3931.0
187.0	4909.0
201.0	6038.0
214.0	7328.0
228.0	8790.0
<b>240.0</b>	<b>10000.0</b>
250.0	10000.0
260.0	10000.0
300.0	10000.0
450.0	10000.0
500.0	10000.0

### 2. 2X 6KW inverter configuration

DC. Volt.	1# Inverter	2# Inverter	Total Power
Vdc.	W	W	W
80.0	386.0	0.0	386.0
94.0	614.0	0.0	614.0
107.0	916.0	0.0	916.0
120.0	1304.0	0.0	1304.0
134.0	1789.0	0.0	1789.0
147.0	2381.0	0.0	2381.0
160.0	3091.0	0.0	3091.0
174.0	3500.0	431.0	3931.0
187.0	4000.0	909.0	4909.0
201.0	4500.0	1538.0	6038.0
214.0	5000.0	2328.0	7328.0
228.0	5000.0	3790.0	8790.0

240.0	5000.0	5000.0	10000.0
250.0	5000.0	5000.0	10000.0
260.0	5000.0	5000.0	10000.0
300.0	5000.0	5000.0	10000.0
450.0	5000.0	5000.0	10000.0
500.0	5000.0	5000.0	10000.0

### 3. 3X 3.6KW inverter configuration

DC. Volt.	1# Inverter	2# Inverter	3# Inverter	Total Power
Vdc.	W	W	W	W
80.0	386.0	0.0	0.0	386.0
94.0	614.0	0.0	0.0	614.0
107.0	916.0	0.0	0.0	916.0
120.0	1304.0	0.0	0.0	1304.0
134.0	1789.0	0.0	0.0	1789.0
147.0	2381.0	0.0	0.0	2381.0
160.0	3000.0	91.0	0.0	3091.0
174.0	3200.0	731.0	0.0	3931.0
187.0	3300.0	1609.0	0.0	4909.0
201.0	3300.0	2000.0	738.0	6038.0
214.0	3300.0	2500.0	1528.0	7328.0
228.0	3300.0	3000.0	2490.0	8790.0
240.0	3333.3	3333.3	3333.3	10000.0
250.0	3333.3	3333.3	3333.3	10000.0
260.0	3333.3	3333.3	3333.3	10000.0
300.0	3333.3	3333.3	3333.3	10000.0
450.0	3333.3	3333.3	3333.3	10000.0
500.0	3333.3	3333.3	3333.3	10000.0

To program the power curve into the inverter:

Use the specific software for the inverter in PC to edit corresponding power curve, and download it to the inverter via the communication interface. E.g. Power One should use Aurora Installer software to edit and download power curve to the inverter;

The detail of programming power curve into PowerOne inverter, please refer to the user manual of PowerOne.

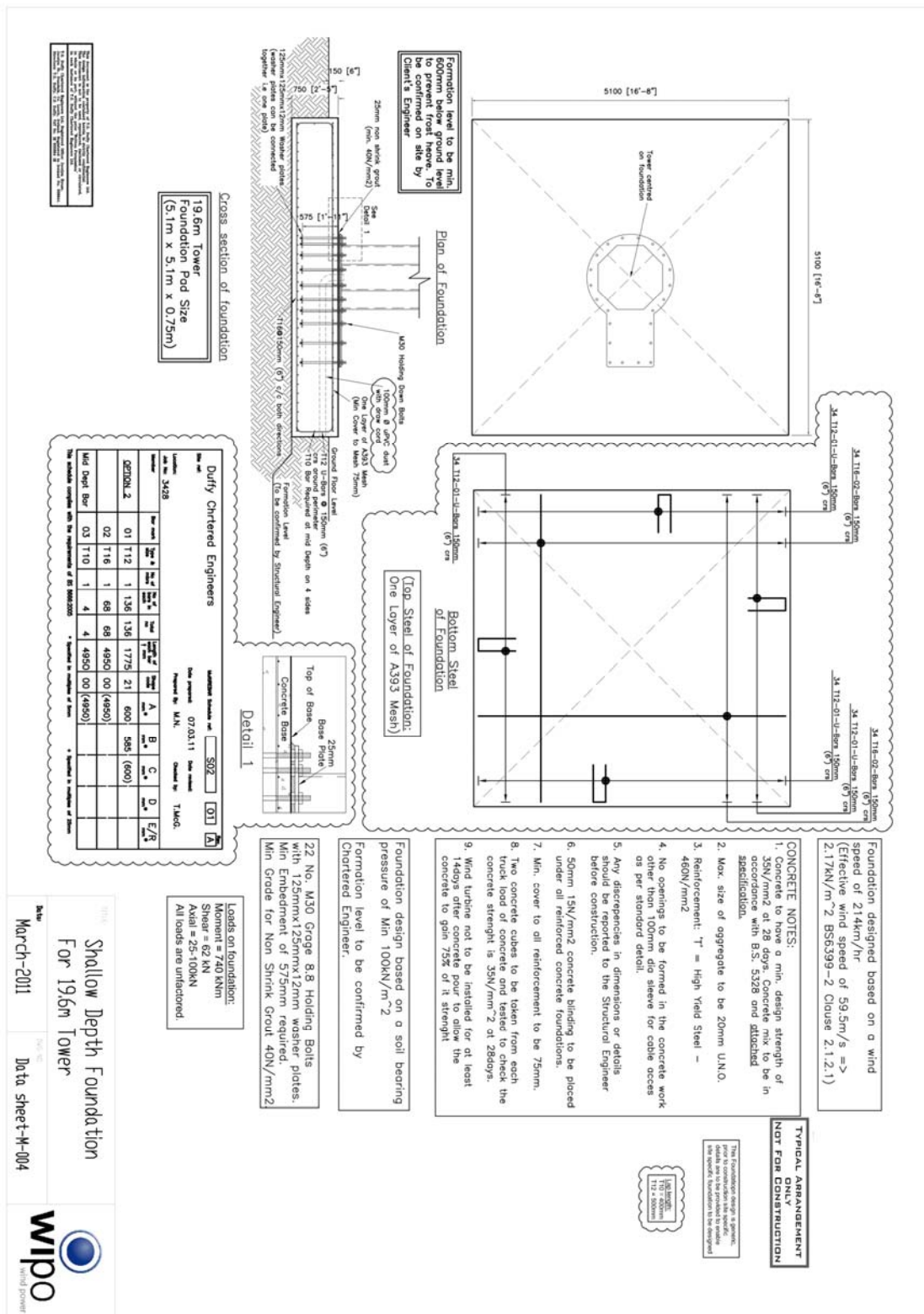
#### NOTES:

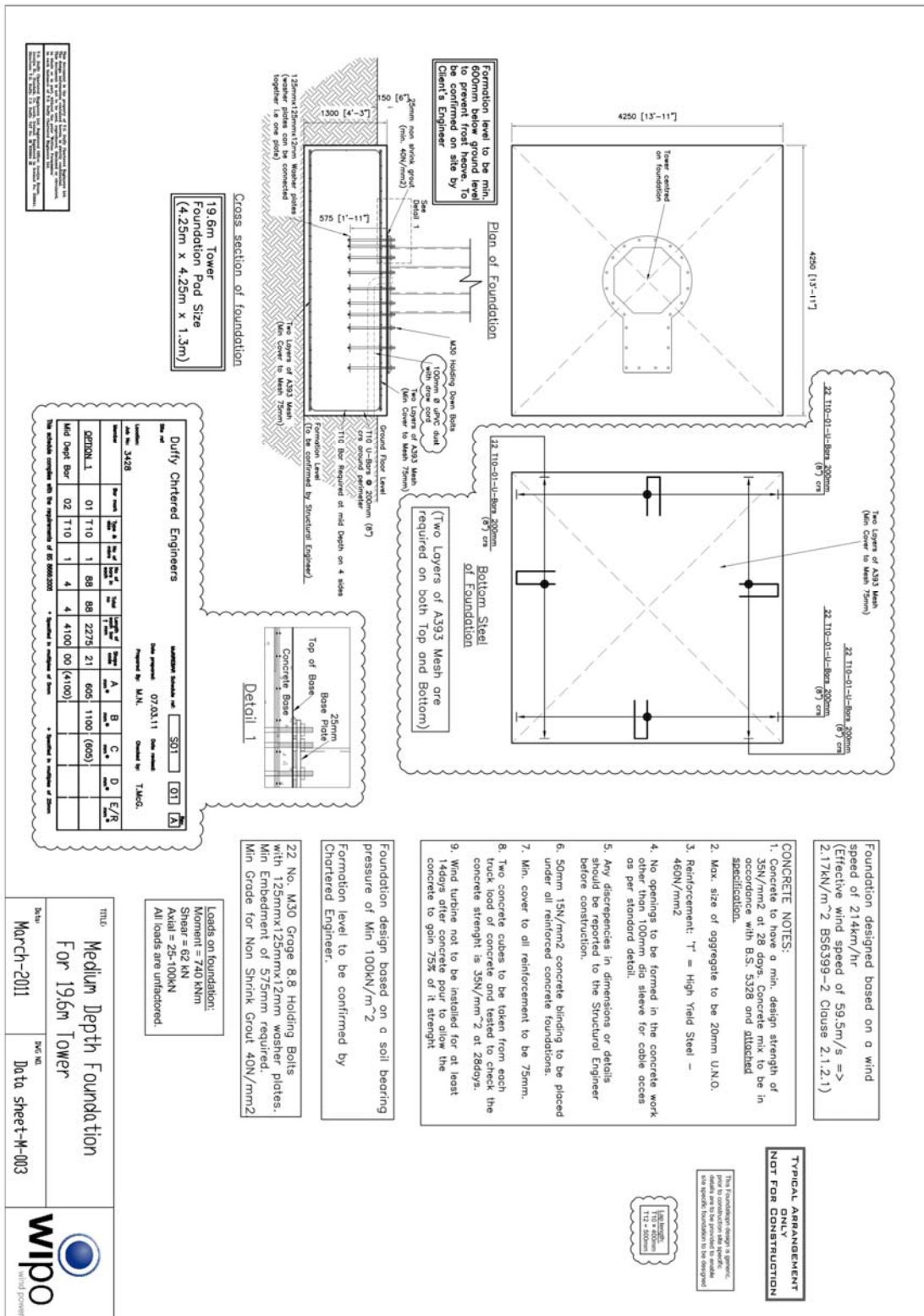
To program the Power One inverter, the inverter must receive a DC power supply of minimum 60V. This is easy done using the WINForce 60V DC transformer.

## 5.5 System Commissioning

1. Check if it has any abnormal alarm
2. Check the real-time data
3. Check internet connection
4. Observe the indicator lights of all equipments. About the meaning of indicators, please refer to appendix 11

## Appendix 1



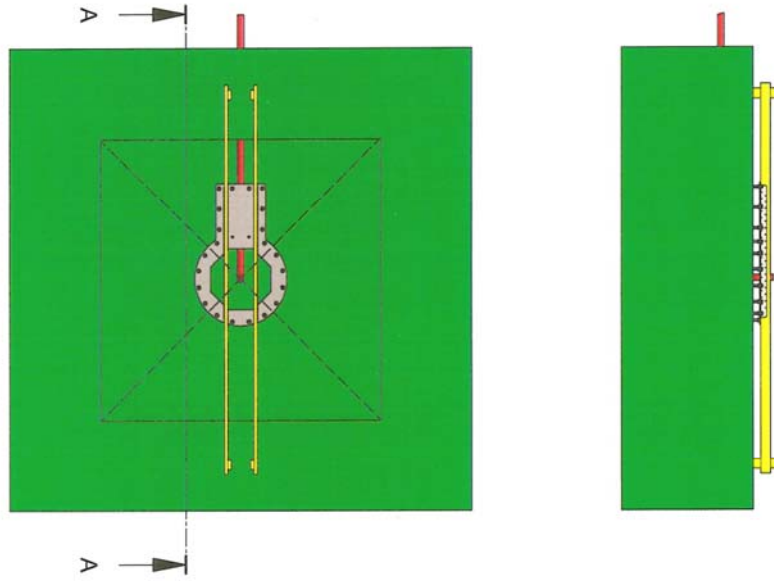




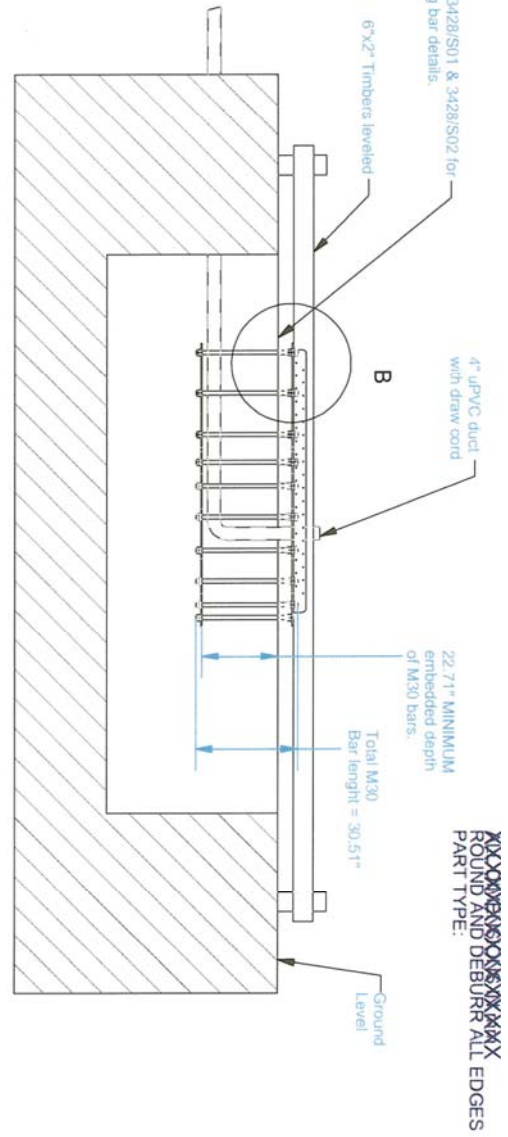
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**Note:** When concrete cures, remove uPVC Tape/sleeve and screw nuts down to the top of the concrete. Remove Jig Plate before installing the tower base.

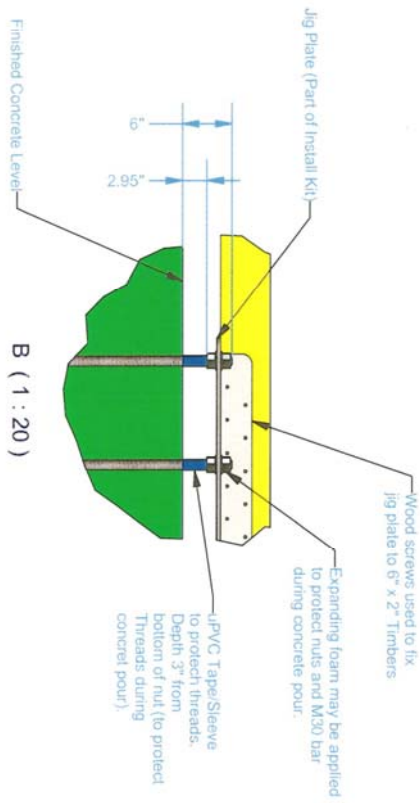


Refer to DEC Drawing 3428/S01 & 3428/S02 for concrete & reinforcing bar details.



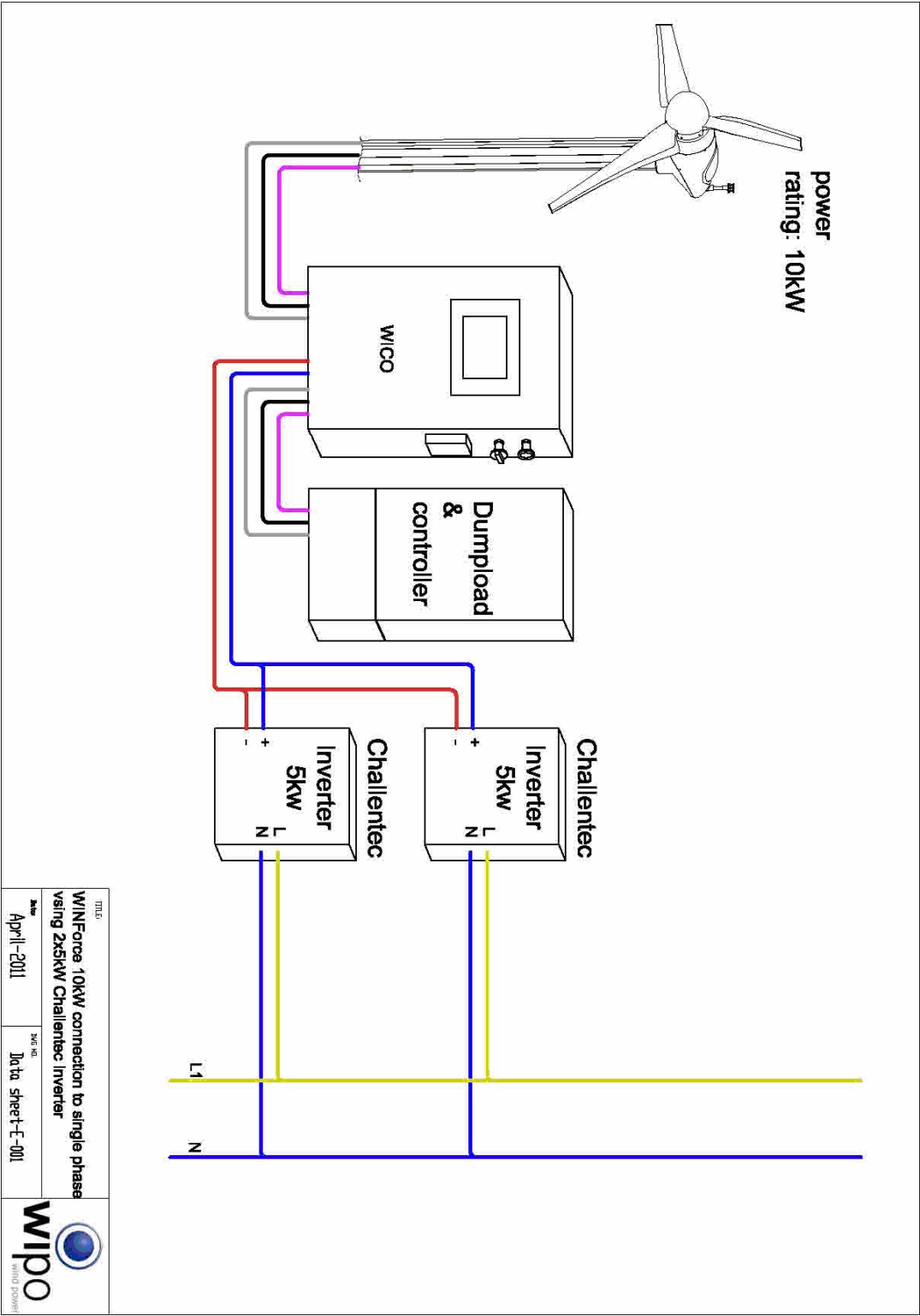
**XXXXXXXXXXXX**  
**ROUND AND DEBURR ALL EDGES**  
**PART TYPE:**

A-A

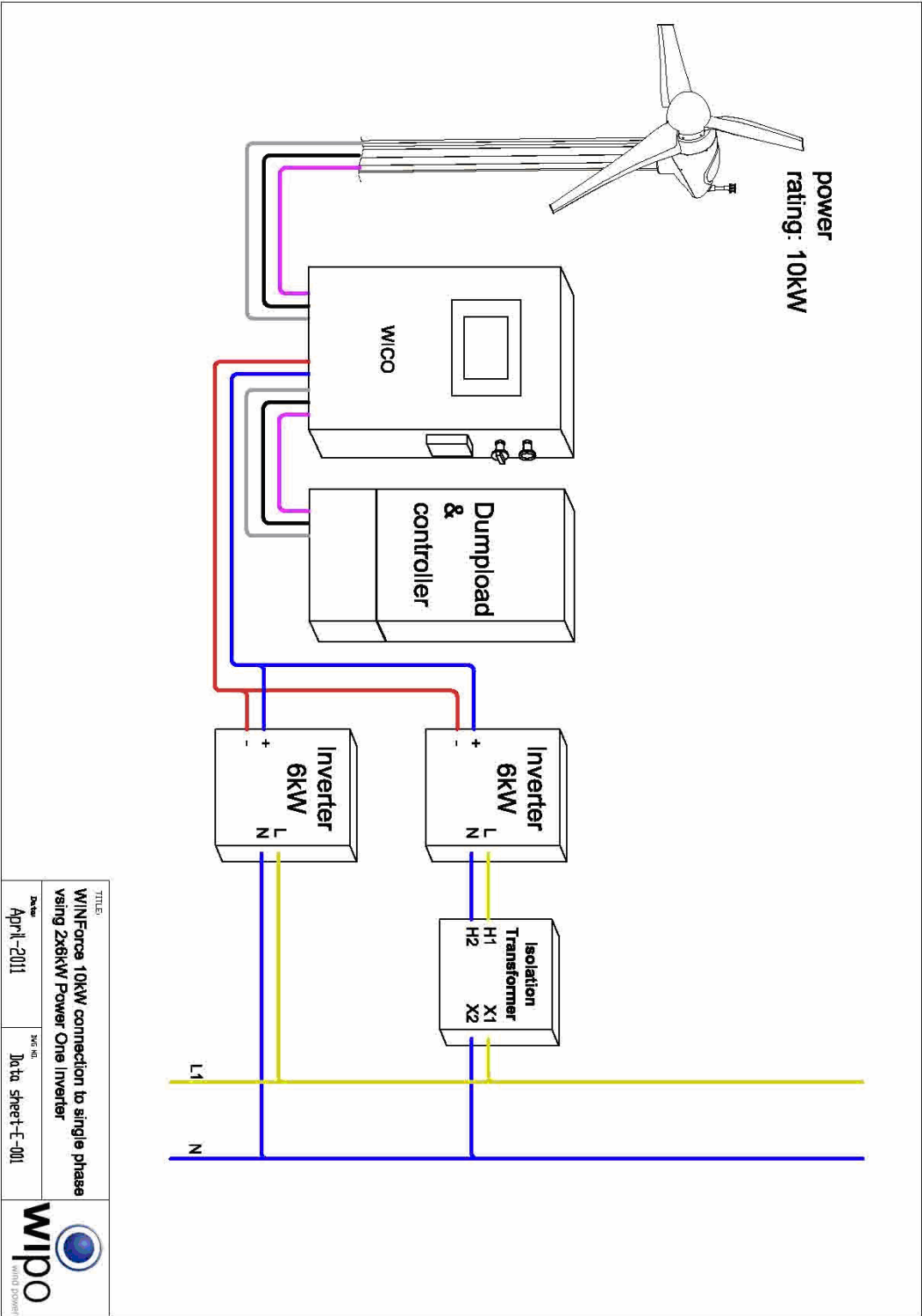


Note: When concrete cures, remove uPVC Tape/sleeve and screw nuts down to the top of the concrete.  
 Remove Jig Plate before installing the lower base.

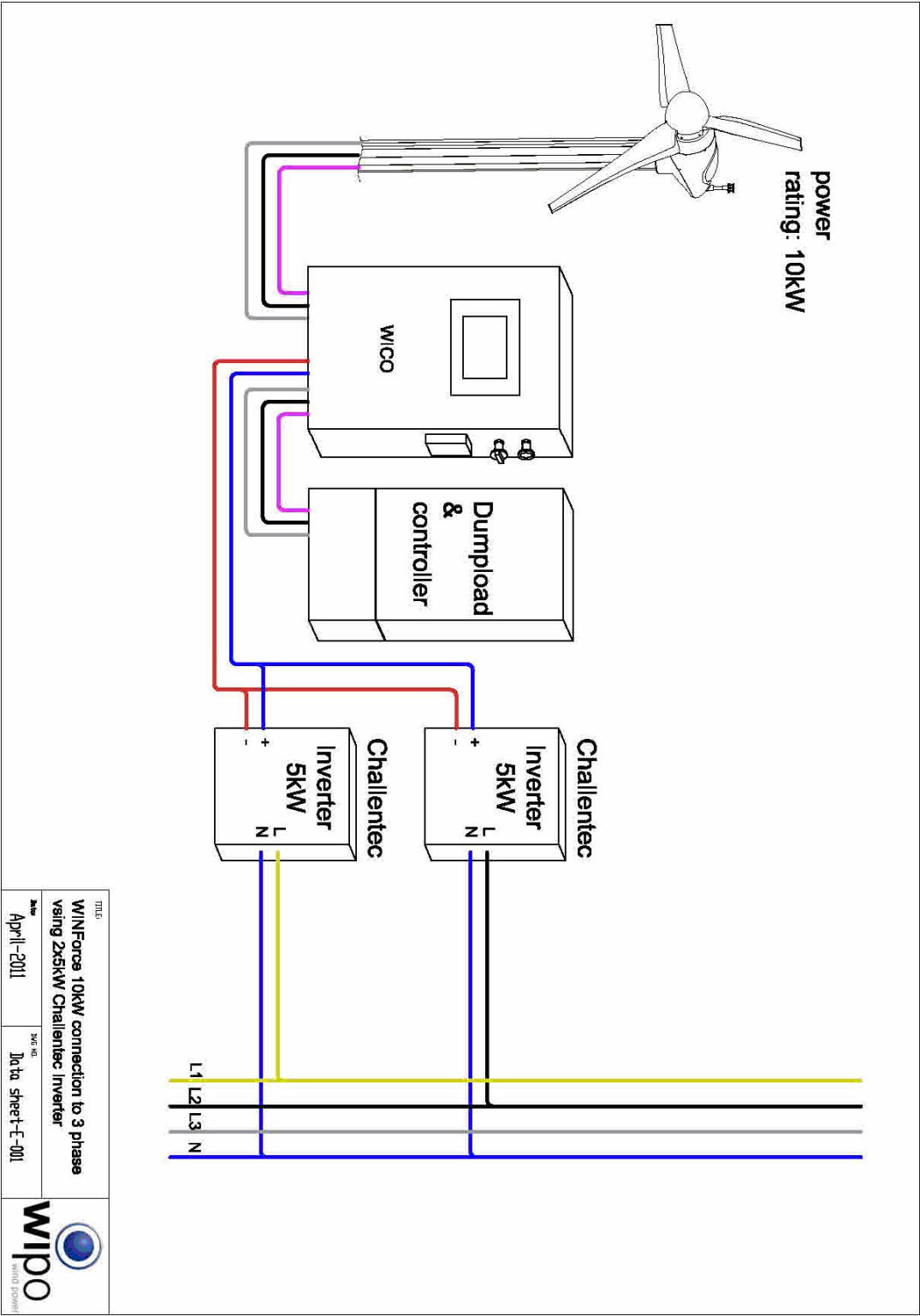
Appendix 4



Appendix 5



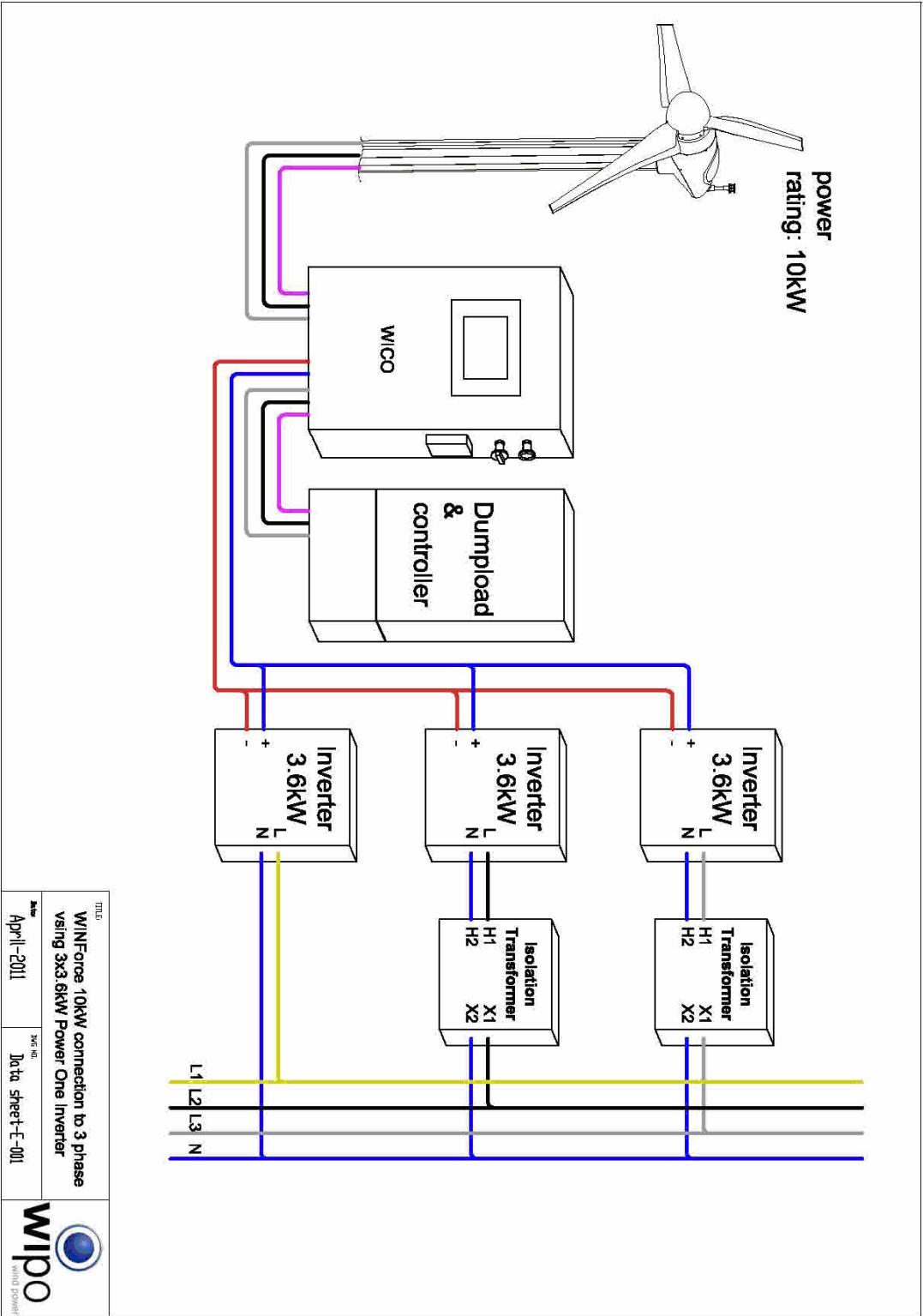
Appendix 6



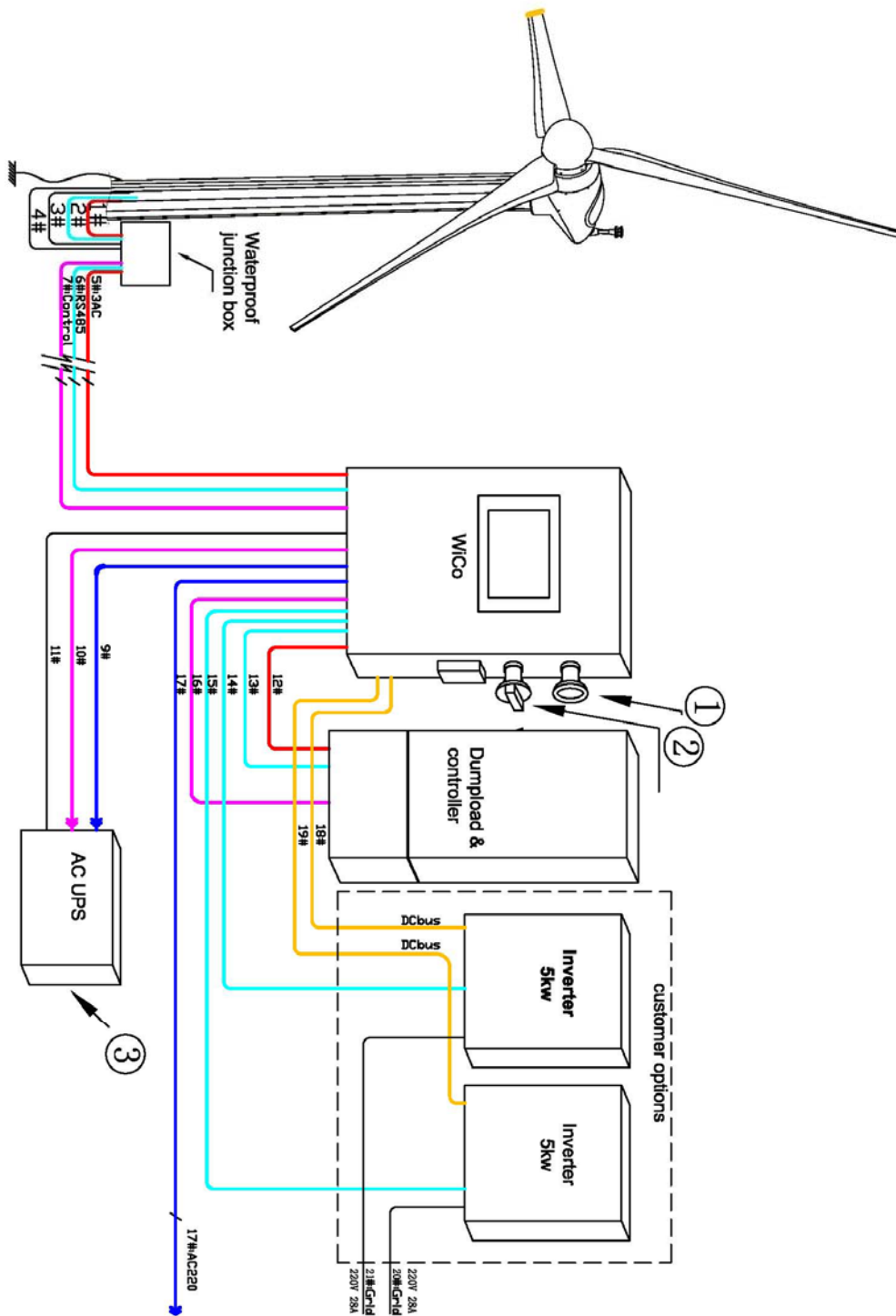
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Appendix 8



## Appendix 9





Appendix 10

